COGNITIONS AND EMOTIONS AS PREDICTORS OF RECOVERY IN CONDITIONS INVOLVING PHYSICAL DISABILITY

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ABSTRACT.

Patients with conditions involving physical disability vary considerably in the course of their recovery. Initial severity as judged by clinical examination is the usual baseline for predicting eventual outcome but considerable variability has been observed in the process of recovery in patients with conditions of similar initial severity. Recognizing the many potential influences on the process of recovery, medical, personal, environmental and social, this study investigated psychological factors as predictors of different aspects of recovery. The hypotheses tested were that cognitions, such as the patients' perceptions of their condition and its implications for them, their perceptions about their control over their own recovery, the attributions made about their condition and events in their recovery, the ways in which they coped with the problems imposed by their condition and their emotional responses, would be more reliable predictors of different aspects of recovery from physical disability than initial clinical severity. Physical disability was conceptualized at two levels, as restriction in the performance of movements and restriction in the performance of functions and activities.

The investigation was undertaken in four stages. Early exploratory work of the first two stages studied over 100 patients with physical disability during the process of their recovery, by observation, semi-structured interviews and videorecording. In the third stage methods of measurement of clinical indices of the selected conditions were developed and tested with the study population. Psychometric methods were also tested and where necessary developed. In the fourth stage hypotheses about the relationships between clinical indices and psychological factors were tested with 40 subjects with physical disability, 20 with stroke, 20 with a wrist fracture.

There was considerable support for the overall hypothesis that psychological factors would be reliable predictors of different aspects of recovery. Initial clinical severity was a poor predictor of outcome in terms of performance of movements and functions, and individual perceptions of severity of condition showed little relationship to objective measurements of severity. Perceptions of personal control over recovery were associated with more effective recovery in terms of performance, and general level of raised emotional response with some less effective levels of performance. These results need to be re-examined using larger groups of subjects, and including those with other conditions involving physical disability to find if results can be generalized. The results provide information about factors influencing the process of recovery from conditions involv ing physical disability.

SECTION I

Chapter 1

General Introduction

The initial separation of disease processes from their consequences, and the different dimensions of these consequences have been well conceptualised by the W.H.O. in their International Classification of Impairments, Disabilities and Handicaps (1980). Within this classification disease processes may result in impairment at the level of systems and organ function, this in turn may result in disability reflecting the consequences of impairment in terms of functional performance; handicap which may result from impairment and disability, which is concerned with the disadvantages experienced by the individual as a result of impairments and disabilities.

Individual differences in response to disease processes are recognised within this framework, and this is supported by the differences observed in the behaviour of individuals suffering from similar conditions involving physical disability. Shontz (1971) McDaniel (1976) Visotsky (1961).

Cohen and Lazarus (1980) in a major review of work in this area state that there is much clinical evidence to suggest that despite similarities in their medical condition, individuals differ greatly in the course of their recovery. However, there is little evidence in the literature that accounts for these observed differences; clear descriptions of the process of recovery are lacking and factors have not been identified which will reliably predict the type, extent or speed of recovery from physical disability of different kinds.

Physical disability is usually conceptualised in terms of restriction of performance of normal movements and activities which are notoriously difficult to assess and measure reliably. Assessments of performancereflect impairment of systems or structures involved in the performance of movement, the individual's skill in performance despite this impairment, their motivation to perform and the extent of their compliance with instructions in a test situation.

Observed changes in performance may arise from a number of other sources, including natural resolution, social and environmental factors, the treatment and management the individual is receiving; his own response to his condition and to the situation in which he finds himself may also influence change.

It was this last aspect that was of particular interest in this thesis. Though little work has been done to investigate the influence of psychological factors on recovery from specific physical disability, in other areas of health and illness numerous investigations have been reported. The influence of the expectations of both patients and professional staff on patients' response to treatment procedures, reported by Beecher et al. (1953) Pincus (1966) Wolff (1954) and others. The influence of communications between doctors and patients demonstrated in work by Ley (1977, 1980) Ley and Spelman (1967), Francis et al. (1969), Korsch et al. (1972) and Reynolds (1981). The relationship between perceived control and preventive aspects of health care such as weight reduction Balch and Ross (1975), modification of smoking behaviour Steffy et al. (1970) and contraceptive use Harvey (1976).

The relationship between appraisal and subsequent behaviour has been reported by Folkman and Lazarus (1980). Perception of threat, individual coping resources and physical illness have been investigated by Lipowski (1970) and Moos (1977); and Ray (1982) has identified the different coping strategies used by patients with different conditons.

Studies investigating psychological aspects associated with recovery have frequently been undertaken with groups of patients undergoing surgery. A number of psychological factors have been examined in relation to a wide range of factors indicating recovery, levels of anxiety being related to indices of recovery in studies reported by Janis (1958), Wolfer and Davis (1970) and Johnson et al. (1971), Johnston and Carpenter (1980).

A few studies have investigated the relationships between progress in rehabilitation involving physical disability and a number of psychological variables. Moos and Solomon (1965) found greater degrees of functional incapacity related to more physical symptoms and greater depression and apathy, and Weiss et al. (1971) reported finding a relationship between severity of disability and psychological adjustment, though Wolff et al. (1966) in an earlier study did not report finding similar results.

In general, studies in the field of health and illness suggest that psychological factors may have an important influence on the process of recovery, and this thesis seeks to examine the process of recovery, from physical disability and the extent to which cognitive and emotional factors predict different aspects of the recovery process and discover if a best predictor can be identified.

Because there was little work in this area the thesis involved early exploratory work and the stages of the work are described in Table 1 p. 13.

Based on the results of work in other related areas, the expectation was that psychological factors would be more reliable predictors of recovery than objective measures of initial severity of physical disability.

The early chapters of the thesis deal with concepts of recovery, and details are given of the development of methods of measurement of factors under investigation. Later chapters deal with psychological factors that were examined in relation to recovery processes; hypotheses about these relationships were tested, and the results are given and discussed.

Table 1

STAGES IN THE INVESTIGATION.

	Stage 1	Stage 2	Stage 3	Stage 4
Subjects	85 Patients 58 Therapists	10 Patients 10 Therapists	114 Patients 50 Therapists	40 Patients 72 Therapists
Aims	To investigate process of recovery in patients with conditions involving physical disability.	To monitor patient-therapist interaction and obtain more in depth information from patients and therapists, to identify appropriate clinical indices of recovery and select psychological predictors.	Developing and testing methods of measurement of (a) clinical symptoms in two selected groups of patients (b) psychological variables selected as predictors of recovery.	Testing hypotheses about the relationships between change in 'clinical symptoms' indicating recovery and selected psychological variables.
Methods	Observation Unstructured interviews with patients and therapists.	Tape-recorded interviews Video-recording of therapeutic sessions.	Semi-structured interviews - probe questions Rating grids Check lists of affective states. Analysis of video-recorded interviews.	Monitoring changes in clinica indices at specified points i time. Collecting information on psychological variables. Mood adjective check lists. Rating grids. Semi-structured interviews.

Chapter II

Population of Subjects.

A population of subjects was selected to examine recovery from physical disability. They were recruited from departments of physiotherapy in seven different hospitals. All were patients receiving treatment for conditions involving physical disability. Details are given in Table 2 p. 17. The total number of subjects was 403, this includes subjects in the early exploratory stages, those used in the development of measures and the final group of 40 subjects who were used intensively and repeatedly to monitor the process of recovery from physical disability, therapists who were treating the patients and judges used in the development of measures and examination of results.

In the early exploratory stages recruitment was not restricted to subjects within specific diagnostic categories, but this became necessary in the later stages when detailed assessment of symptoms was an essential part of monitoring the process of recovery. Two diagnostic groups were selected. The basis for selection was that

1) the condition involved impairment which resulted in physical disability

2) the natural history of the condition suggested that change towards pre-morbid status was expected

3) that patients with that diagnosis were frequently found.

The two groups chosen fulfilled these criteria, and represented disability arising from very different types of impairment. The difference was important so that the thesis could examine recovery in more than one type of disability. The two diagnostic groups were: patients suffering from stroke, and patients who had sustained a wrist fracture. The two groups are described, and clinical indices central to the disability of each group are given.

Stroke group.

Consisted of subjects who had suffered a cerebrovascular accident, had survived the onset with a residual hemiplegia, paralysis of one side of the body. The symptoms following a cerebrovascular accident cover a wide range because the impairment is in the central nervous system - the control centre - and the type and extent of some of the symptoms were grounds for exclusion, as the dysfunction arising from them would have precluded participation in the study; they were severe speech deficits, mental confusion; other severe intercurrent illness was also an excluding factor.

The following symptoms are common to and characterize the condition of stroke, and were found in varying degrees in the subjects of this group. Change in normal muscle tone with interference in the smooth performance of movements of the affected side of the body, this either flaccidity, a decrease in tone with little or no muscle activity, or spasticity, an increase in tone with the affected muscles in a state of spasm or co-contraction. A number of sensory disturbances of sensation of touch, of normal joint position sense, of body schema, unilateral neglect of the affected side, hemianopia, and disturbances in bladder and bowel function were also found.

Wrist group.

Consisted of subjects who had sustained a fracture of the wrist - the lower end of the radius - and had the forearm immobilized in a plaster of paris cast until bony union was established. The following symptoms characterized this group on the removal of the plaster splint: restriction of movements of the hand and wrist, localized oedema in the region of the fracture, reports of pain and localized tenderness and diminished muscle strength.

From the symptoms in the subjects in each group clinical indices were identified which characterized the condition at onset, and in

which changes might be expected during the process of recovery. These clinical indices were used to monitor the process of recovery in each group and were at two levels of performance, performance of movements and performance of functions or activities. Both representing disability, restriction or limitation of performance. The clinical indices of each group were as follows:-

Stroke group.

1. (a) Restrictions in performance of gross body movements.
   (b) Restriction in performance of limb movements.
2. Restriction in performance of personal care activities.

Wrist group.

1. (a) Restriction in the performance of wrist movements.
   (b) Reduction in muscle strength.
   (c) Presence of localized oedema.
   (d) Patient reports of pain.
2. Restriction in the performance of personal care activities.

Table 2

THE STUDY POPULATION

Number	Criteria	Study Purpose
	Patients	
85	Subjects with Physical Disability	Observation and unstructured interviews.
10	Subjects with Physical Disability	Monitoring patient therapist interaction.
24	Subjects with wrist fracture	Eliciting constructs for rating grids.
34	Subjects with stroke	
12	Subjects with stroke	Development of Body movement scales.
9	Subjects with stroke	Development of self care scale.
10	Subjects with wrist fracture	Development of movement scales.
12	Subjects with wrist fracture	Development of measures of oedema.
13	Subjects with wrist fracture	Pain measurement and development of self care scale.
20	Stroke patients	Monitoring recovery.
20	Wrist patients	Monitoring recovery.
249		

Table 2 (Continued)

THE STUDY POPULATION

Number	Criteria	Study Purpose
	Therapists	
58	Therapists treating patients with physical disability	Investigating process of recovery from physical disability from therapists' viewpoint.
50	Therapists treating patients	Development of methods of measurement.
10	Therapists treating 10 selected patients	Monitoring patient therapist interaction.
72	Therapists treating stroke and wrist group subjects	Providing information about subjects in the study who they were treating.
190		
	Judges and Independent Assessors	
10	Judges	Developing locus of control scale.
2	Independent Assessors	Development of movement scales.
2	Independent Assessors	Content analysis of interview material to find coping strategies.
14		

SECTION II - RECOVERY

Introduction

This section seeks to define concepts of recovery appropriate in the context of physical disability, to identify factors that are central symptoms of disability and to test, and where necessary, develop methods of measurement to monitor them.

It seeks to explore whether recovery from physical disability, as exemplified by stroke and a wrist fracture, can be predicted satisfactorily from the initial level of impairment or disability. If a satisfactory prediction is not achieved then it is possible that cognitive and emotional factors may play an important part in predicting outcome and this will be explored in later sections. This section contains three chapters as follows:-

Chapter 1 Discusses models of health and illness and concepts of recovery related to these. Outlines the first task of the thesis, to find the extent to which initial levels of disability predict later levels of disability.

Chapter 2 Discusses previous methods of measurement of physical disability and their suitability for the present purpose. The development and testing of tools for measuring clinical indices of the selected groups are described, and their use in monitoring recovery from physical disability is discussed. Methods appropriate to this thesis are developed and evaluated on patient populations.

Chapter 3 The process of recovery from physical disability was monitored in the study population of 40 patients with physical disability (described in Chapter I) using methods tested and developed and reported in Chapter 2.

Chapter I

Health and Illness.

It is clear from the literature that there are no generally agreed definitions of either health or illness; nor can they be seen as opposite ends of a continuum from positive health to severe illness. At an individual level at least the states are not mutually exclusive, illness in the form of pathological symptoms or abnormalities may be present yet the individual may perceive themselves as quite healthy Herzlich (1973), others in the absence of pathological symptoms report feeling ill and far from well, Wilson Barnett and Fordham (1982). Both health and illness are complex entities and the terms usually refer to different though related dimensions; health usually being associated with positive desirable and normal states, illness with negative undesirable and abnormal states. A number of models and approaches have been developed conceptualizing health and illness in different ways, and some of these will be discussed in more detail.

Medical models of health and illness.

Within the disease-based medical model the focus is on illness or disease which is identified by the presence of pathological signs and symptoms or other abnormalities, illness being the positive state, health the negative state identified by the absence of pathological signs. This model is suitable for the study of disease processes in acute illness and is typified by the International Classification of Diseases (I.C.D. W.H.O. 1975) which provides a classification of diseases and conditions for collecting data for statistical purposes. Disease processes are obviously part of the spectrum of health and illness but do not encompass the totality of the experience for the individual, nor are they useful in studying longer term diseases and conditions

and their consequences.

Recognizing the limitations of the disease-based model for planning the provision of services, the WHO in 1980 put forward the International Classification of Impairment, Disability and Handicap (I.C.I.D.H.) for dealing with the consequences of disease. The aim was to provide both a conceptual framework and also clear definitiions of the terms which were widely but ambiguously used when discussing more chronic conditions. Within this framework Impairments are concerned with disturbances at the level of the organ or system function, Disability represents the consequences of impairment in terms of functional performance and activity at a personal level, and Handicap is concerned with the disadvantages experienced by the individual as a result of impairment and disability, reflecting interaction with and adaptation to the individual's environment.

Because it deals with the consequences of disease, rather than the specific underlying pathology, the conceptualization behind the I.C.I.D.H. does provide a useful framework for considering the level of the problems of patients with longer term conditions and those with conditions involving residual or increasing dysfunction. Its strength is that it allows change to be considered at the separate levels of impairment disability and handicap. Though each may follow the other they do not necessarily occur together; impairment does not always result in disability nor disability in handicap. However, the framework was essentially constructed to provide statistical information about the consequences of disease in the population and is therefore not altogether suitable for assessing and monitoring progress in individuals, the sub-sections which offer scoring of different items are lengthy and difficult to use, and their reliability and validity remains unproven. The model provides for the health professional to

observe and classify individuals on their performance within this framework, but does not take the individual's perspectives into account, it is most useful for its original purpose of collecting population statistics about the consequences of disease.

Sociological models.

In sociological approaches, health and illness are defined in terms of social behaviour, the emphasis on this rather than biological reality. Parsons (1951) conceptualized the problem of health as intimately involved in the functional prerequisites of the social system, illness seen as a form of deviance that society must control. Parson's analysis of the roles of doctors and patients in our society provide a theoretical frame of reference, but is only valid in western societies and even then is not appropriate for studying individual responses to illness.

Durkheim's (1897) is a model where the distinction between normal and pathological is based on statistical frequency - what is frequent is regarded as normal and provides a criterion of health, what is infrequent is regarded as abnormal and provides a criterion of illness. Though this may be helpful in examining health and illness within a sociological framework in society, its use is limited in work with individuals.

Abnormality as defined by statistical infrequency is not always helpful when looking at individuals, as statistically infrequent - and therefore in this sense abnormal - physical and mental characteristics are not necessarily abnormal in the sense that they inhibit or impede performance in any way.

Psychological perspectives.

There is considerable evidence to suggest that individual concepts of health and illness vary considerably, and that there are also major differences between the concepts health professionals have about their

patient's state of illness and that of the patient themselves and those of lay people in general. Health and illness are complex entities for the individual and cannot be contained within the simple concept of negative and positive states, and as either present or absent. Herzlich (1973) found that her subjects in general saw being healthy as normal and natural, being unhealthy as abnormal, not natural - these characteristics used as a norm for considering a continuum from health to illness, the more normal and natural the more healthy, but what was normal and natural was not based on biological reality. Individual assessment of states of normality in health appeared in Herzlich's study to be based mainly on two concepts: the extent to which the present characteristics of the individual were perceived as deviating from the normal, the normal being identified as a state of personal equilibrium, and the expectations that were held about the future course of the illness. Within this thesis an individual may perceive himself as healthy while recognizing the presence of illness. "I've had a stomach ulcer for ten years but as long as I watch my diet it doesn't prevent me from enjoying good health" (p.54). The state of personal equilibrium in relation to health is examplified in the following statement given by one of Herzlich's subjects: "I'm in good health when I am in equilibrium, when I feel capable of doing what I want". The concept of equilibrium underlying health included the following themes: a sense of physical wellbeing, plenty of physical resources, absence of fatigue, psychological wellbeing, freedom of movement and effectiveness of action. The individual perspectives based on the relationship of the disease to the individual with the individual interpretation of states of health or illness not based on aetiology, or anatomical or physiological localizations, rather with the emphasis on the implications for present and future life.

The experience of being ill results from both the physical symptoms which are the external manifestations, and the subjective feelings. The consequences of illness as conceptualized by Herzlich's subjects were more widespread and involved psychological integrity, behaviour, dependence, mood and inactivity. The work of White et al. (1967) supports the importance of activity restriction as a criterion used to define illness. 'Illness for the majority of patients is characterized by activity restriction and discomfort". These individual perspectives show great variability between individuals and often differ from that of the health professional.

Recovery from Illness.

Though numerous studies claim to have monitored recovery from different conditions, the concept of recovery itself appears complex and defies any simple definition - this may not be surprising in view of the multifaceted nature of the concepts of health and illness. Most studies of recovery from illness refer to recovery as a process of change 'a process of returning to the patients' premorbid level of health', Wilson Barnett and Fordham (1982). This may be for the competitive athlete a full regaining of 'own normal musculoskeletal characteristics and capabilities' Sapega and Nicholas (1981) or a return to habitual activities of a less demanding nature. A wide range of different aspects have been studied to monitor the process of recovery, they fall into three broad categories, concerned with clinical or medical factors, with behavioural aspects or with individual characteristics.

The clinical approach.

This approach is related to the disease-based medical model of health and illness. The focus is on pathology, on the abnormal signs

and symptoms which indicate the presence of disease, a diminution in these indicates progress from illness to health.

Indices of recovery used in the clinical approach to recovery have been such things as the results of laboratory tests of blood or other body substances, body temperature, cardiac state and the results of other clinical tests. Though important, these indices are measuring only one aspect of a complex process, other aspects must also be monitored to obtain a clearer picture of the overall process. There is evidence to suggest that this objective medical viewpoint is not necessarily closely correlated with individually perceived recovery. Wilson Barnett and Fordham (1982) suggest that there is often a mismatch between clinical morbidity and patient perceived morbidity, 'The clinical signs and symptoms of the disease may have disappeared but the patient still feels far from well and unable to resume former activities'. Roberts et al (1984) in a study of lumbar disc surgery report patients' self-ratings of 'not improved' did not always agree with medical criteria of improvement during recovery. Medical concepts of recovery where absence of pathological indices of disease indicate that disease processes are inactive may be important in deciding drug and other regimens, but covers only one facet of this complex process.

The behavioural approach.

In this broader approach where the focus is not only on pathological signs, a wide range of factors have been used to monitor recovery. White and Murnaghan (1969) identify activity restriction, and discomfort as central to monitoring the recovery of physical fitness. Fordham (1982) pinpoints the importance of the inter-relationship between pain and movement restriction in recovery. The following have been reported as measures used to monitor recovery in different groups of patients: In industrial accidents, time off work Goldwyn and Day (1969), Johns (1981); in physical disability, assessments of degree of

incapacitation, degree of discomfort/pain Rosillo and Fogel (1970); exercise tolerance testing by self-paced walking with time taken and distance covered as indices,Bassey et al (1976), and performance of lifting tasks and climbing stairs with back pain patients, Roberts et al (1984). In studies of recovery from surgery variables have included number of analgesics and wound complications Wolfer and Davis (1970), emotional reactions Spielberger (1973), length of stay in hospital, pain measures and independent self care Johnston and Carpenter (1980), minor complications, days in hospital and negative psychological reactions Cohen and Lazarus (1973). Johnston (1982) suggests that these measures used to monitor recovery are at two levels: representational, which describe the process of recovery, and index, which correlate to some extent with the property being measured but do not describe it, a change in index measures reflecting a change in the property being measured, but changes in property not necessarily being reflected in index measures. Representational measures within this conceptual framework are the clinical symptoms of the disease process and reflect the biological status of the patient, index measures include a wide range of variables. Wolfer and Davis (1970) in a review of measures used time to ambulation, physical complications, incidence of vomiting, number of analgesics requested, skin condition, independent self care, days in hsopital and return to work; all are index measures. These measures are considered to reflect the success or otherwise of recovery, the increase in desirable characteristics such as independent self care and decrease in undesirable characteristics such as physical complications and incidence of vomiting,indicate a successful recovery.

The behavioural approach to recovery is related to sociological models, and psychological perspectives of health and illness.

The psychological approach.

In Herzlich's (1973) study few people used actual physical state or pathological signs, as a basis for their decisions about states of health and illness, activity restriction and inability to perform usual activities was the criterion most often used. This is supported both by White and Murnaghan (1969) 'Illness for the majority of patients was characterized by restriction of activity and discomfort', lessening of discomfort and increase in activity indicating recovery, and Wilson Barnett and Fordham (1982), 'The goal of recovery from the patient's perspective is resumption of habitual activity and absence of discomfort'. Recovery in these terms refers to the process of change from activity restriction towards what is normal or what constitutes personal equilibrium. The individual perspective not only appears to differ from that of the professional but is also idiosyncratic, each individual making assessments on the basis of their own knowledge and experience and the implications of the event as they perceive it.

The multifaceted nature of recovery is evidenced by the wide range of different factors which have been used to monitor and investigate the process. In the studies reported there is little positive correlation between the different types of measurements used, Wolfer and Davis (1970), Johnson et al (1971) which supports the contention that recovery is not a unitary concept, and measures used reflect different aspects related to a process which occurs following the onset of illness or trauma. Different aspects may be affected by different factors, for example disease processes by drug regimens, behaviour by ward routines and staff attitudes, and the emotional response of the individual. Each of these may also interact in a continuing process, the effect of the disease processes at an organic level may influence emotional responses and behaviour, these in turn influencing the disease processes.

A number of studies suggest that more sensitive monitoring is necessary to elicit the effect of psychological variables. Allodi and Montgomery (1979) found that unadjusted length of time off work as a dependent variable did not pick up the effect of social and psychological variables, but when time off work as a percentage of the doctors' estimate of required time off work was used the influence of job satisfaction on return to work was demonstrated. Wortman (1977) found that patients with spinal injury who blamed others for their accident had a poorer outcome. Cuming and Henry (1961) found factors associated with delayed recovery were low self esteem and perceiving oneself as old, sick or disabled.

Recovery from physical disability.

For the subjects of this thesis who had conditions which involved specific physical disability arising from the impairment of systems and structures controlling movement, recovery was conceptualized as a process of change in disability, that is the extent and type of limitation of movement and activity; a change in these levels of disability towards a pre-morbid level. Changes in measures of disability were conceptualized as representational indices of recovery.

In conditions which involve specific physical disability clinical symptoms relate to changes in performance, performance of movements, and activities. However, the level of performance at any point in time will reflect not only the extent and type of impairment of systems and structures, but also the individual's adaptation to the altered functioning of body systems. Initially in most conditions involving physical disability recovery starts with some reversal of pathological changes, repair of body tissues and localized absorption of products of injury or inflammation, this permitting a return to more normal functioning of neuromuscular and musculoskeletal systems. Rosillo

and Fogel (1970) suggest that recovery from physical disability has two phases, the first lasting until the pathology of the condition has stabilized, the second the rehabilitation phase when the individual takes part in procedures aimed at decreasing disability. This process of recovery may proceed until there is a full return to premorbid levels of organ structure and functioning of systems or stop at any point before full premorbid status is regained. When this occurs, performance may still continue to change but this will not be reflecting recovery at the level of the system. With the present level of sophistication of investigative techniques, it is not possible to monitor localized changes in sufficient detail, therefore performance at any time will reflect function both at an organic or systems level, the individual response to this and the interaction between the two.

Despite the inability to separate completely the effect of organic change and individual response to that change, recovery from disability for this group of patients was conceptualized as occuring at two levels, that of the performance of movements which reflected organic change more closely and the performance of functions and activities where the influence of the individual's response to their condition would play a larger part. It was accepted that performance at any point in time would reflect organic change, responses to that change and the interaction between the two.

In investigating recovery from physical disability to find whether cognitive and emotional factors would predict the type and extent of recovery, it was necessary first to establish how much of the variance between initial and later disability could be explained by initial severity of disability.

Physical disability was examined at two levels: restriction of performance of movements, and restriction of performance of activities. The performance of movements being more directly related to impairment

at the level of organs, systems and structures, performance of activities being at the level of the person and his environment.

The aim of the next two chapters of this thesis is to examine the relationship between initial levels of physical disability and later disability. In order to be able to assess and measure levels of disability and to monitor changes if they occurred over time, it was necessary to seek and test, and where necessary develop tools of measurement. The next chapter considers the tools of measurement, and the following one reports the monitoring of physical disability for specified periods of time in the study population.

Chapter II

Measurement of Physical Disability

This chapter reviews methods of measurement of physical disability and discusses their suitability for measuring clinical indices of recovery in the two selected groups. Where suitable methods were not found the development of tools of measurement is described.

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Examination of methods used to measure physical disability is complicated by the considerable confusion in the use of the terms used to describe aspects of disability. Sainsbury (1973) discusses motor capacity, self and household care, physical dependence and the capacity for work all under the heading of disability (p.35), while Jeffreys et al. (1969) describe motor capacity and physical dependence as impairment, and use the terms impairment and limitation synonymously (p.303). Stichbury (1975) investigates the assessment of locomotor ability under the heading of disability, and Katz et al. (1970) consider any restriction of function of any activity of daily living as being part of the dynamics of disability. Harris (1971) used only the terms handicap and impairment to describe the restriction of the same activities and movements.

Most methods of measurement of limitation of performance of movements or function, whether described as impairment, disability or handicap have been developed for one of two purposes, either to obtain population statistics Jeffreys et al. (1969), Harris (1971) and Sainsbury (1973) or to assess individual performance in a therapeutic setting, Katz et al. (1963), Stichbury (1975), Sheik et al. (1979), Lincoln and Leadbitter (1979), Whiting and Lincoln (1980).

Within this thesis performance of movements of limbs, trunk, head or whole body and are considered without reference to tasks; performance of functions or activities refers to performance of purposeful activities and tasks such as dressing or eating. A summary table of published tools of measurement of impairment, disability and handicap is given overleaf.

Measurement for population statistics.

Population surveys designed to identify disability or handicap in the general population for administrative or planning purposes have used a wide range of items - these include cooking, shopping, going on holiday Harris (1971), preparing and cooking a hot meal, running to catch a bus and hanging out the washing Sainsbury (1973). Jeffreys et al. (1969) included simulations of normal activities such as lifting a tumbler and screwing and unscrewing a jar and stepping on and off a 6" block. The authors of these tests give no evidence of their validity or reliability when used with specific populations

A number of different factors meant that tests constructed for population statistics were not suitable for monitoring recovery from physical disability, firstly because of the lack of evidence of their reliability or validity for the present purpose, secondly the number of items used would have made their repeated use too lengthy for a clinical situation and thirdly many of the items were either not appropriate or lacked specificity in relation to the dysfunctions of the study population.

Measurement in a clinical setting.

Tools for the measurement of performance in a clinical setting come into two categories; those investigating the performance of movements, motor performance, and those investigating the performance of functions or activities A.D.L. scales.

Table 3

SUMMARY TABLE

Forms Used in Assessment of Neuromuscular and other Disabling Conditions

Test with Reference	Date	Purpose	Terms Used	ITEMS				Stated Reliability and Validity									
				Function	Movement	Mobility	Self Care	Total No.	Cumulative Scale	Scoring	No. of points per item	No. of centres used	Inter-rater reliability	Test-Retest	Conforms to Guttman scaling	Criterion related validity	No. of Subjects
BARTHEL INDEX Mahoney, F. & Barthel, W. Maryland State Med J. April 21, p. 61-65.	1965	Functional evaluation for neuromuscular and musculoskeletal conditions	Independence			✓	✓	10	Claims to	0 5 with help 10 15 independent	4	1					
Tests for measuring motor impairment in prevalence studies. Jeffreys et al. J. Chron. Dis., Vol. 22, 303-319	1969	Prevalence of individuals in a population with motor impairment.	Impairment Limitations	✓	✓	✓		24	✓	2=incomplete movement 1=with help 0=independent	3	1	✓	✓		✓	65
INDEX OF A.D.L. Katz, S. et al. Gerontologist 1970, Part 1, Vol. 10, p. 20-30.	1970	Index of independence of chronically ill and aging populations, hips and stroke.	Disability Independence			✓	✓	6		3 categories differently defined each item	3	1			✓		300+
HANDICAPPED AND IMPAIRED IN GREAT BRITAIN Harris, A. P.O.C.S. London	1971	To obtain estimates of handicapped people living at home.	Handicapped Impaired Disablement			✓		13		1=very aware 2=severe 3=appreciable 4=minor	4						
Disability following head injury. Stichbury, J. Physiotherapy, 61, (9), p. 268-272.	1975	Assessment of disability following head injury	Disability Locomotor ability		✓			36		0=complete movement ½=doubtful 1=no movement	3	1					138
Disability - model and measurement technique. Williams et al. Br. J. Prev. Soc. Med., 30, 71-78.	1976	Provide a model and measurement techniques for disability.	Disability			✓	✓	11	✓	0=did not perform 1=perform activity	2				✓		245
						✓	✓	10									31
Guides to the evaluation of permanent impairment. Amer. Med. Assoc.	1977	Guide to surgeons of evaluating permanent impairment	Impairment Disability Function Motion	✓	✓			Joint 16		measured in percentages	0-100						
ADL Index in studies in chronic disability. Skeikh, K. et al. Int. Rehab. Med. I, 51-58.	1979	Assessment of stroke patients	Disability			✓	✓	7	✓	1=without assistance 2=some assistance 3=inability to perform.	3	1	✓	✓		✓	116
ADL assessment of stroke patients. Whiting & Lincoln. Occupational Therapy, February 1980, 44-46	1980	Assessment of patients.	Function			✓	✓	31	✓	1=dependent 2=independent with help 2=independent	3	1	✓		✓	✓	50
Assessment of motor function in stroke patients Lincoln, N. & Leadbitter, D. Physiotherapy, 65, (2), 48-51	1980	Assessment of function in stroke patients	Motor function	✓	✓	✓		38	✓	0=fail 1=pass	2	1	✓	✓	✓		

Motor performance.

Numerous tests have been developed by different hospitals and centres to assess the motor performance of patients receiving treatment. A survey of hospital physiotherapy departments in England and Wales revealed that over 200 forms were in use in 1980; most of them had not been published and were only used locally others such as Brunnstrom (1970) Assessment following stroke, Stichbury (1975) Assessment of disability following head injury, and Bobath (1976) Assessment of quality of movement, have been published, but evidence of their reliability or validity when used for specific populations is lacking. Only a few recent papers such as Lincoln and Leadbitter (1979) and Sheik et al. (1979) give any information about the validity and reliability of their tools of measurement (see Table 3).

In motor performance tests items were similar, including movements of the limbs such as shoulder shrugging, dorsiflexion of the foot, flexion and extension of the elbow, and movements of the trunk and whole body, turning from side to side in lying, sitting up from lying and standing from sitting. Some tests also included more complex activity items such as cutting putty with a knife and fork into bite size pieces, Lincoln and Leadbitter (1979). The total number of items in these tests was in most instances, except that of the Bobath quality of arm and leg movement scale, in excess of 30, with administration time between 45-60 minutes.

The length of these tests made them in their full form unsuitable for the present purpose, and the fact that they contained items of performance of both movements and activities, together with the lack of any evidence of their reliability was the basis for deciding that they would not be used to monitor recovery from physical disability. However items, particularly those in the Bobath (1976) form would be used for developing a shorter scale.

Activities of daily living (A.D.L.) scales.

Duckworth (1982) reported over 200 tests for assessing performance of activities of daily living. Most contained personal care and other activity items, but few gave any evidence of their reliability, and again most were unpublished. Duckworth commented on the necessity for simplifying forms, standardizing them and testing the validity and reliability of items. Tenil et al (1969) in a review of A.D.L. scales listed the following as being the activities most frequently found: toileting, transferring, eating, walking, dressing, bathing and bladder control. Whiting and Lincoln (1980) produced a scale containing items referring to the same activities, and this scale unlike most of the earlier scales provides some evidence of its validity and reliability when used with specified groups of patients. These scales use 2, 3, 4, or 5 scoring points, usually depending on the amount of help needed to perform an activity, and contained 31 items.

Standardization of the performance of activities is difficult as most essentially involve environmental and other factors, which may of themselves vary, these variations affecting performance. For example, the ease with which clothes are put on may vary according to design, the accessibility and height of the lavatory facilitating or making toileting more difficult. The amount of help needed will depend on who is giving the help, an experienced helper in whom the patient has confidence may only need to give minimal help to perform the activity but a lot of help may be needed for the same activity with inexperienced helpers in whom the patient has little confidence. Scores here may reflect the environmental factors rather than patient performance.

A number of different aspects made these scales inappropriate for use with the population of physically disabled subjects under investigation. The total number of items in most scales was high and the administration time beyond that which would be available for patient assessment.

Since none of the forms available were suitable for monitoring changes in physical disability in the two selected groups of subjects it was necessary to develop and test suitable tools of measurement. Because the physical disability of the two groups of subjects differed, the clinical indices and therefore the necessary tools of measurement had to be developed independently and they are reported separately.

Development of methods of measurement

Stroke Group

Performance of movements

What was needed was a method of monitoring change in levels of physical disability in terms of performance of movement that was short, reliable and easy to administer. Movements that were particularly affected by the onset of stroke were gross body movements and limb movements, tools for measurement of both were developed.

1. Gross body movements

Items for this scale were selected because they were central to the disability as described in the literature, as observed in the preparatory stages of the work of this thesis, and were found included in most other forms purporting to measure physical disability. The movements were also the whole body movements that form the basis of most everyday activities.

A 7 item scale was produced to measure initial disability in terms of performance of movement and to monitor changes in disability during the process of recovery.

Method

Each subject was assessed on referral for treatment when their medical condition was considered stable with no increase in symptoms expected, and on one subsequent occasion. Assessments were undertaken with the therapist requesting the patient to perform the movements which were then recorded with the video-recorder. All recordings were taken in physiotherapy departments with subjects on treatment plinths of standard size and design.

Subjects

N=12, 7 male, 5 female, age range 29-89. All had been referred for rehabilitation in two hospitals following the onset of a stroke involving residual hemiplegia - limitation of movement of one side of

the body.

Materials.

(1) The form contained at first 12 items of movement, but during pilot work it was found that inter-rater reliability in scoring was low for five items concerned with balance, so these were excluded. The following seven given here in order of simplest to most complex, are similar to that of Bobath (1976) and Stichbury (1975).

A. Turn over in supine lying position to lie on right side.

B. Turn over in supine lying position to lie on left side.

C. Sit upright from lying supine.

D. Maintain sitting balance for ten seconds sitting on the edge of the plinth.

E. Get off the plinth onto a chair on affected side.

F. Stand up from sitting position and maintain standing position for ten seconds.

G. Walk six steps.

(2) A Sony Rover Videorecorder AVC 3450CE.

Procedure.

The purpose of the assessment was explained to the physiotherapist treating the patient and to the patient. The items were requested in order from A to G using the following verbatim instructions:-

A. Turn onto your side so that you are lying on your right side.

B. Turn onto your side so that you are lying on your left side.

C. Sit up so that your head and shoulders are off the bed and you are sitting upright with feet on the floor.

D. Maintain this sitting position without falling over while I count to ten.

E. Get off the plinth and sit in the chair on that side (towards affected side).

F. Stand up from where you are sitting on the plinth and maintain your standing balance while I count 10. You may use a stick but not hold on to the furniture.

G. Walk six steps, using a stick or frame if necessary.

If the movement did not occur the first time unaided, the instructions were repeated. If the movement did not occur on this occasion, help necessary to complete the movement was given by the therapist.

The performances were videorecorded, and the tapes viewed independently by two assessors, the author and a clinical psychologist. Each performance was rated in two ways - firstly as to whether the activity was performed or not, secondly whether it was performed independently or not.

Scoring was as follows:-

1. Performed activity	= 1
Did not perform activity	= 0
2. Performed activity independently	= 1
Did not perform activity independently or did not perform activity	= 0

Results

For each subject scores were available from two separate assessments. Two scores were obtained from each patient on each occasion, a disability score which represented the number of items that were performed, and an independence score representing the number of items performed independently. The means and standard deviations for the 12 subjects are given in Table 4. Full data is in the appendix p. 230.

Table 4

Assessment of Gross Body Movement Scores

	Mean.	S.D.	Range.
Assessment I			
Disability	2.9	1.6	0-6
Independence	1.75	1.2	0-4
Assessment II			
Disability	5.0	1.7	2-7
Independence	3.5	1.0	2-5

The validity and reliability of the scale was examined.

Face Validity. The items were those central to the disability caused by this condition, and training of the performance of these movements was included in all treatment approaches observed. The scale was accepted as a valid measure of disability in the performance of gross body movements by both subjects and staff.

Content Validity. Appropriateness of items. The scale was designed to obtain a measure of disability in terms of restriction of gross body movements, the items were all movements involving the head, trunk and limbs, were basic movements necessary for mobility, and were similar to those contained in other forms for assessing disability in patients with conditions of neurological origin. The items are those frequently mentioned in the literature on disability arising from stroke.

Construct-related Validity. The scale was constructed to monitor recovery from physical disability. The items were central to the restriction of movement in subjects with stroke, and all subjects passed more items or the same number of items on the second occasion, thus the scale was monitoring change in the direction of less

disability see Table 4 for means of scores on two assessments.

Internal Consistency.

Scalogram analysis was performed on the scores as a means of analysing underlying operating characteristics of the items in order to examine if their inter-relationships met the several special properties which define a Guttman Scale - (1953) that is were they unidimensional in that component items all measured movement towards or away from a single underlying object, and cumulative - the characteristics that differentiate Guttman Scales. Defined operationally it requires that respondents scoring positively on difficult items always score positively on less difficult items and vice versa. The conventional levels for acceptable error are based on mathematical and statistical explorations and are relatively stringent. Conventionally acceptable levels for indicating the presence of a Guttman Scale are measured by two co-efficients, the co-efficient of reproducibility which give the proportion of all items predicted correctly from each respondent's total scores, an overall co-efficient of reproducibility of .9 or over confirms the existence of a valid Guttman Scale. The co-efficient of scalability gives information about the proportion of remaining responses that could be correctly predicted using the scale hypothesis, values above .6 indicate a valid scale.

The scores obtained from the 12 subjects on two assessments were subjected to scalogram analysis using the Guttman Scale sub-programmme of the Statistical Package for the Social Sciences Nie et al (1975) (S.P.S.S.). Each subjects's score on each of the seven items on the two assessments used. Each item being scored as pass or fail as to whether it was performed or not (disability) and whether it was performed independently or not (independence).

The results obtained from this analysis showed a co-efficient of reproducibility of .96 and of scalability of .86. Both above the conventional limits for assuming the presence of a unidimensional and cumulative scale. Therefore the Gross Body Movement Scale was considered to be both unidimensional and cumulative.

Reliability. The reliability of the scale was tested by assessing inter-rater reliability. No attempt was made to find test retest reliability of this scale as the patients were in the recovery phase of their condition, changes were expected and any change in scores on re-testing might have reflected change in the patients' level of performance rather than variability in the tool of measurement being assessed.

Inter-rater reliability. The inter-rater reliability of scorers of the videorecorded sessions was high. There was only one discrepancy when one rater scored the subject's movement as 1, the other rater scored the subject's movement as 0.

Discussion.

As the extent of the validity and reliability of scale had been demonstrated and evidence of its cumulative and unidimensional nature provided by Scalogram analysis, the scale was used as a tool for measuring performance of Gross Body Movement to monitor recovery from physical disability.

2. Limb Movements.

Bobath (1976) developed an assessment form containing items which were central to the disability resulting from stroke. The items were used to assess quality of movement in terms of performance of arm and leg movement patterns. A shortened version of these assessment of quality of movement forms were used with six leg and eight arm items.

Method.

Each subject was assessed on two separate occasions. Subjects were placed in the appropriate starting position by the research worker, and then asked to perform the movement. Two assessors, the research worker and a therapist scored each movement independently as either yes, did perform the movement independently, or no did not perform the movement.

Subjects

N = 12, 7 male, 5 female, age range 29-89. All had been referred for rehabilitation in two hospitals following the onset of a stroke one to six weeks previously involving residual hemiplegia, and all were receiving treatment.

Materials

Two forms as follows:

Form 1 Leg movements

Supine

1. Bend affected leg (heel to knee)
2. Lift pelvis off support (both knees flexed, feet on support)
3. Dorsiflex ankle

Sitting

4. Adduct and abduct affected leg (foot on ground)

Standing

5. Stand on affected leg lifting sound one (momentarily)
6. Stand on affected leg, lift sound one, bend and extend supporting leg.

Form 2 Arm movements

Lying supine

1. Hold extended arm in elevation when placed in position.
2. Bend elbow from arm in elevation to touch top of head.
3. Lift arm to touch opposite shoulder with hand.

Sitting.

4. Hold extended arm in elevation when placed in position.
5. Bend elbow from arm in elevation to touch top of head.
6. Lift arm to touch opposite shoulder with hand.
7. Supinate forearm and wrist.
8. Place hand flat on table in front.

Procedure.

The purpose of the assessment was explained to the subject. The movement was described verbally, demonstrated and where appropriate the movement first performed with the unaffected arm or leg. The following verbatim instructions were given:

Leg: Supine.

1. Slide your affected leg up so the heel is opposite your other knee.
2. Lift your hips off the plinth.
3. Bend your foot up towards you.

Sitting.

4. Keep your foot on the ground and take your knee out sideways and back again.

Standing.

5. Stand on both feet, then lift your unaffected leg off the ground for a moment.
6. Stand on both feet, then lift your unaffected leg off the ground and bend and straighten your affected leg.

Subjects practiced the movements first on the unaffected side.

Arm: Supine.

1. Hold your arm in the position I have put it in above your head
2. Bend your arm from this position (in elevation) to touch the top of your head.
3. Lift your affected arm and put your hand on the opposite shoulder.

Sitting

4. Hold your arm in the position I have put it in above your head
5. Bend your arm from this position (in elevation) to touch top of your head
6. Lift your arm to touch the opposite shoulder with your hand
7. Turn your forearm so that your palm is facing upwards
8. Place your hand flat on the table in front of you, palm downwards.

Two assessors observed the performance, the research worker and a therapist - each item was scored:

1 = movement completely performed

0 = movement not completed performed or not performed at all.

If the movement was not performed at the first attempt, a second was allowed and this scored.

Results

The means and standard deviations of the scores of the twelve subjects are given in Table 5 full data is given in the appendix p.230.

Table 5

Movement of arm and leg scores.

	Mean.	S.D.	Range.
Assessment I			
Arm	1.9	2.8	0-6
Leg	2.4	1.6	0-5
Assessment II			
Arm	2.5	3.3	0-8
Leg	3.5	1.9	0-6

Validity and reliability of the scale were examined.

Face Validity. Was high, subjects recognized the items as movement patterns that were most restricted, changes in them being regarded as progress.

Content Validity. Appropriateness of items - the scale was designed to measure changes in abnormal patterns of movement. The items were the main movement patterns restricted in the arm and leg.

Construct Validity. The aim of the scale was to measure changes in the disability, the restriction of normal arm and leg movement patterns. The results when the scale was used with the 12 subjects showed that the mean scores on the second assessment for both arm and leg scores exceeded the mean score of the first assessment and the range of scores increased in both scales, increase in scores indicating decrease in disability.

Reliability. Two independent observers of the subjects' performance rated each item, no subject was scored 1 by one observer, 0 by the other.

Discussion.

These scales were shown to be valid for monitoring change in disability of arm and leg movements, and reliable under the stated conditions. It was short, with only 14 items in all - the next shortest Lincoln and Leadbitter (1979) containing 25 items, and therefore was used as the arm and leg Movement Scales.

3. Performance of self-care activities.

Performance of self-care activities have been monitored in two ways, firstly by setting up a test situation which resembles the naturally occurring situation in which to assess the activity, and secondly using self-reports about the performance of the activity in daily life. There is little evidence to suggest that

performance in a test situation bears a close relationship to performance in everyday life, and as this was the focus of interest here, information was collected about performance of self-care items in daily life. Both self-report and observation were used to monitor performance. It was recognized that self-report measures may be inaccurate because of faulty recall or the influence of bias - wishing to appear more or less capable. Because of this attempts were made to make these reports as accurate as possible. In early pilot work it was found that when subjects were asked to recall performance on specific occasions i.e. 'Did you have any help with dressing this morning?', they gave more specific answers such as 'I only needed help with the buttons of this shirt', whereas the more general question 'Do you have any help with dressing yourself' might be answered negatively without reference to a specific occasion. In order to check on the accuracy of these reports performance was observed and ward staff (where possible) also reported on usual performance. This was not always possible because of frequent staff changes.

Method

Subjects' reports of their performance on the six self-care items were collected in a standard way. Level of performance was observed by the research worker and by questioning ward staff when possible. The information was collected on three occasions.

Subjects

N = 9. 5 male, 4 female, age range 29-89 years. All referred for rehabilitation in two hospitals following the onset of stroke involving residual disability in the form of hemiplegia.

Materials

A form on which six self-care items were listed:

1. Feed
2. Wash
3. Undress

4. Dress

5. Toilet

6. Bath

Procedure

The purpose of the questions was explained to the subjects who were asked to rate each self-care item separately as:

Performed independently = 1

Needed help of some kind

or

did not perform activity = 0

Each subject was asked to consider the component parts of the activity as performed that day or the previous day, and the whole activity graded for the lowest grading of any component of the activity i.e. if help was needed with any aspect of dressing this activity graded as 0 needed help, even though some parts may have been performed independently.

Results

The scores for the nine subjects, means and standard deviations are given in Table 6 full data is in the Appendix p. 230.

Table 6

Personal Care Scores

	Mean.	S.D.	Range.
Assessment I	1.2	1.3	0-4
Assessment II	2.4	1.9	0-6

Validity and reliability of the scale were examined.

Face Validity. Subjects found the items central to their disability and appropriate for assessing level of restriction of personal care activities.

Content Validity. The items covered a representative sample of self-care behaviour, central to activities of daily living, and were those contained in all longer A.D.L. scales.

Construct-related Validity. The scale was constructed to measure recovery from disability i.e. restriction or limitation in the performance of self-care activities. All subjects had some limitation of performance of self-care activities on the first assessment. At the second assessment all subjects either scored more (7) or the same (2). This showing that changes in level of disability in the performance of self-care activities was being monitored.

Internal Consistency. Submitting the data obtained on the six items to scalogram analysis to find if a Guttman scale (see p.41) was present, coefficients of reproducibility of 0.93 and of scalability of 0.63 were obtained, both conventionally acceptable levels for demonstrating the existence of a unidimensional and cumulative scale.

Discussion.

Since this was a naturally occurring situation rather than a contrived test situation there was some day to day variation in performance, and because it was 'usual' performance rather than maximal performance this may have underrated ability. Subjects who had newly acquired a skill of performing an activity independently might not be allowed to do so because ward routines might not allow sufficient time. However since the unidimensionality of the scale was demonstrated, it was considered acceptable to use in the study. By using self-report measures and observations the possibility of obtaining false positive reports was reduced.

Wrist Group

Performance of movements.

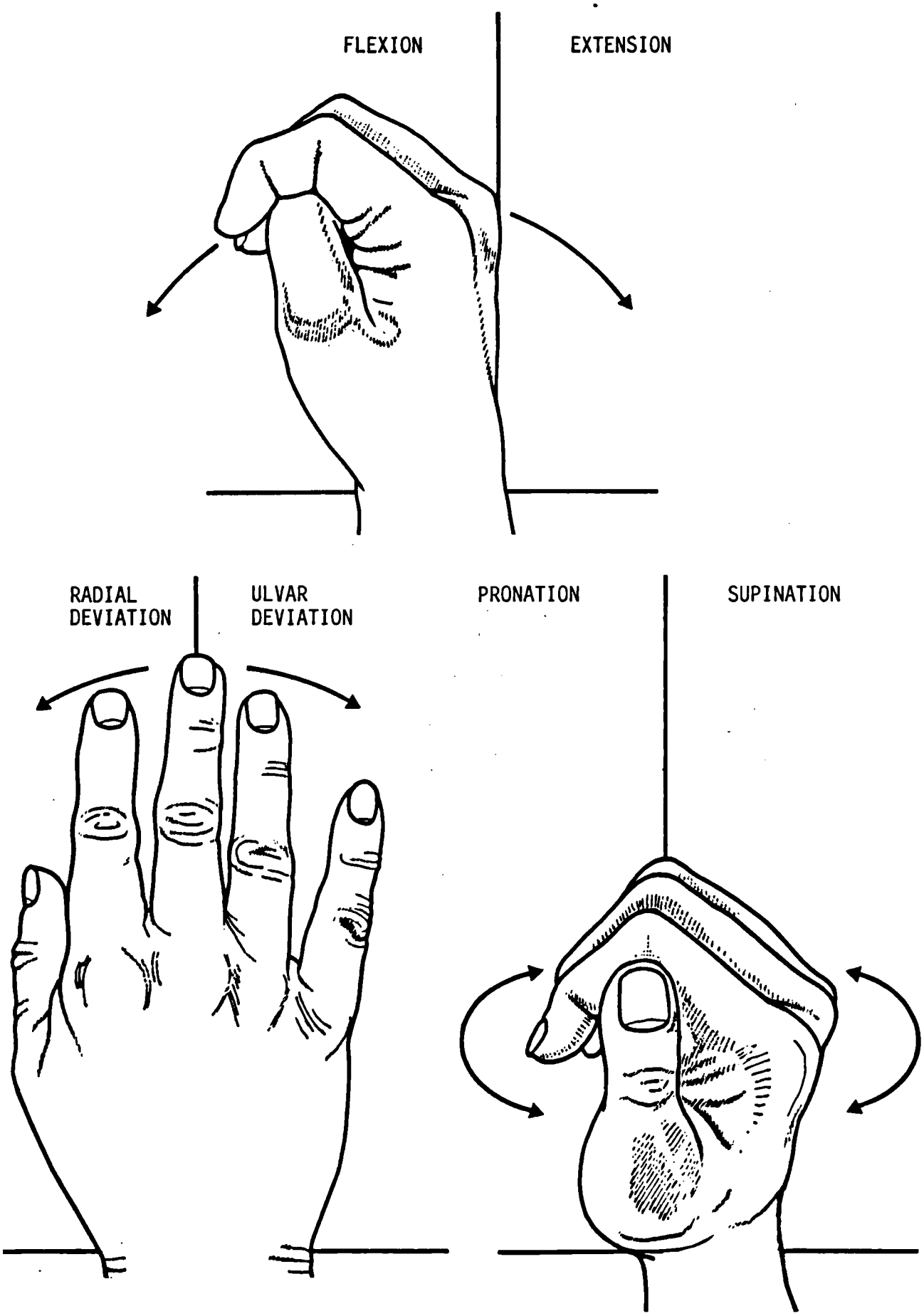
1. Wrist movements.

Because the impairment was localized to the wrist only, methods of measurement for movements in this area were monitored. Six movements are possible at the wrist. The movements take place in three different planes: flexion and extension, radial and ulnar deviation and pronation and supination. See Figure 1.

Attempts to establish normal ranges of movement for different joints have been undertaken for many years Clark (1920), Cobe (1928), Salter (1955) and considerable variations have been found related to age, sex, occupation and method of measurement used. Methods used to measure range of joint movement have included the use of sophisticated equipment such as electrogoniometers and polarized light goniometry, and also the more simple hand-held goniometers; this latter method is most commonly used in clinical practice. The extent of the reliability of this method has been examined by a number of authors including Boone et al. (1978), who found that under controlled conditions with therapists measuring healthy subjects there were intra-therapist differences of 3°-4° on different occasions and if there was more than one tester only changes in excess of 5° for the upper limb and 6° for the lower limb could be reliably attributed to change in the range of joint movement being tested.

In the clinical situation polarized light goniometry and electrogoniometry were not suitable. The wrist is a complex joint which involves no less than 19 joint surfaces and reports of reliability of this joint using hand held goniometers were not available. The problem of centralizing the pivot for movement is complicated at the wrist because of the number of bones involved, and using a long armed hand held plastic goniometer and measuring the wrist movements of

FIGURE 1 WRIST MOVEMENT



flexion and extension in ten normal subjects there was a discrepancy of up to 10°, and this was considered unacceptable.

Since it was the restriction of the range of movement that was of interest it was decided to use the method of fixing the wrist and forearm and measuring the arc of movement through which the hand travelled. There was no real problem with validity since measurement was directly of the property under investigation, the problem was one of reliability.

Method

Ranges of movement of wrist joints of patients with a wrist fracture were measured by fixing the forearm and calculating the range of movement through which the hand passed. In all six movements of each hand were measured. Measurements were taken after the wrists had been removed from plaster of paris splints.

Subjects

N = 10, 8 female, 2 male, age range 32-79. All having suffered a fracture to one wrist.

Materials.

A board 280 mm x 280 mm covered with a sheet of paper marked with a central vertical line and a horizontal line at right angles to it at the base of the board. The base of the board was padded and a velcro strap was attached.

Procedure

(1) Flexion and extension

The ulnar surface of the wrist joint was placed on the horizontal baseline, the lower forearm strapped with velcro strapping. The research worker also held the forearm to prevent movement. The head of the 5th metacarpal and the little finger were placed along the vertical line. The subject was requested to 'bend the hand as far backwards' (extension) and 'as far forwards' (flexion) as possible - the furthest point reached by the head of the 5th

metacarpal bone in each direction was marked on the paper. This point later joined to the junction between the vertical and horizontal lines at the mid-point of the wrist. The angle formed between the horizontal line and this line was the score in degrees.

(2) Radial and ulnar deviation

The palm of the hand placed down with the wrist joint over the horizontal line, the forearm strapped and the middle finger aligned with the vertical line. The fingers and thumb were adducted, the subject asked to 'move the hand to each side as far as possible' while the research worker held the forearm. the most lateral point reached by the head of the first and fifth metacarpal bone was marked.

(3) Pronation and supination

For this movement the ulnar border of the hand was placed on the vertical line, the fingers lightly clenched and the thumb extended with the dorsum facing upwards. The subject was asked to 'rotate the hand inwards and then outwards'. The limit of the movement of the tip of the thumb from mid-point in either directed was noted.

Measurements were taken at the same time of day, the second measurement 2 weeks after the first.

Results

The means and standard deviations of the movement scores obtained are given for each movement in Table 7. Raw scores are given in the appendix p.231. Scores are given for the affected and the unaffected hands.

Table 7

Wrist movement scores.

		Assessment I		Assessment II	
		Mean.	S.D.	Mean.	S.D.
Flexion	Affected	15.2	5.0	17.5	5.4
	Unaffected	28.4	3.3	27.5	3.7
Extension	Affected	23.3	9.2	22.2	16.2
	Unaffected	42.3	14.6	36.6	20.5
Ulnar Deviation	Affected	32.0	10.8	38.6	6.4
	Unaffected	58.2	6.4	58.6	6.7
Radial Deviation	Affected	44.8	7.9	51.4	9.6
	Unaffected	76.1	7.0	76.2	6.5
Pronation	Affected	62.8	4.1	67.0	4.6
	Unaffected	85.5	4.9	83.8	4.8
Supination	Affected	43.7	6.0	48.9	6.3
	Unaffected	66.8	4.4	65.9	4.3

Reliability. Reliability of the scale was investigated by examining the repeated measurements of the unaffected hands.

Reliability co-efficients	Ulnar deviation	.97***
	Radial deviation	.96***
	Pronation	.93***
	Supination	.90***
	Flexion	.75**
	Extension	.99***
	Grip	.97***

Validity did not pose a problem as measurement was directly of the property being studied.

** p = <.01, *** p = <.001

Discussion.

All movements of the affected hands were considerably restricted in relation to movements of the unaffected hands, and the reliability co-efficients demonstrated that this was a sufficiently reliable methods of measuring change, when it was present, in restriction of wrist movements.

2. Hand Grip.

Strength of hand grip has been measured using a number of different dynamometers and grip test meters. There is evidence to suggest that grip pressure as measured by these devices varies with a number of different factors, including age, sex, time of day and occupation Wright (1959), Kjerland (1953), and Anderson (1966). Fernando and Robertson (1982) found that the grip was stronger overall in their male subjects and the difference between dominant and non-dominant hands was less than 10%, Kjerland (1953) did not report consistent differences between the dominant and non-dominant hand. Three standard types of hand grip are possible: a hand clasp as in a hand shake, a pinch grip using the finger tips and a 'lumbrical' grip between the opposed thumb and extended fingers, this the most commonly used.

Again here, as with wrist movement, the measurement was directly of the property being studied, and it was the question of suitability for the present purpose and the extent of its reliability that was tested.

Method.

In a pilot study a number of different dynamometers were used, many had metal grips and subjects found these difficult to hold in their affected hand, the Boots' grip strength meter with soft cloth bag proved most acceptable, and this was used in the following test.

Subjects.

N = 10, 8 female, 2 male, age range 32-79 years. Ten patients who had sustained a wrist fracture attending hospital for treatment following the removal of the splint.

Materials.

A boots' grip strength meter comprising a sphygmomanometer bag with bulb and tube for inflation attached by a rubber tubing to a gauge measuring from 0-300 mm Hg. See Figure 2.

Procedure.

The lumbrical grip was demonstrated to the subjects, the extended thumb in position on a central mark on the grip bag, the extended fingers again against a mark on the opposite surface of the bag. The bag was inflated to 200 mm to provide resistance. Subjects were instructed to grip firmly as strongly as possible, a quick strong grip, and release. Three grips were taken of each hand on two separate occasions, 1 week apart, all at approximately 14.00 hours.

Results.

The handgrip score means and standard deviations are given in Table 8 below. Raw data is in the Appendix p. 231.

Table 8

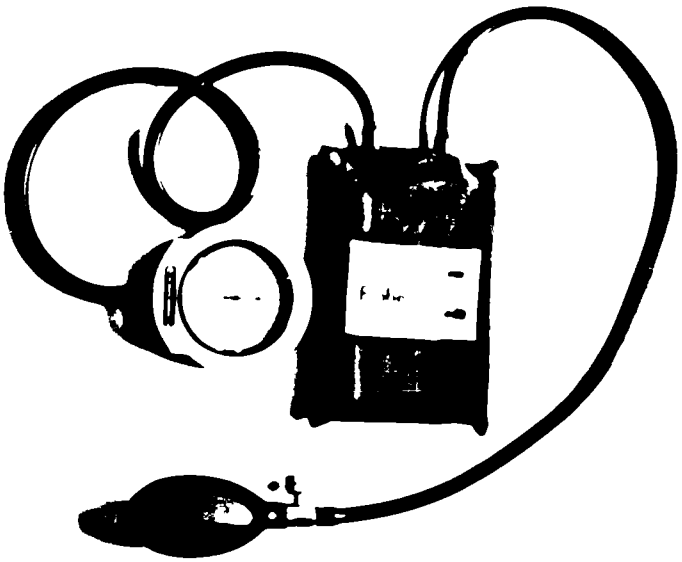
Grip Scores in mm Hg.

		Mean.	S.D.
Assessment I	Affected	43.3	8.5
	Unaffected	153.5	23.5
Assessment II	Affected	72.0	11.5
	Unaffected	152.0	21.0

Validity and reliability of the test were examined.

FIGURE 2

HAND GRIP METER



Face validity. Lack of grip strength was a symptom mentioned by all subjects and therefore its measurement appropriate to recovery, increasing strength being seen as progress towards pre-morbid state.

Construct related. Reduced strength of grip was a central symptom of this condition. Scores showed that for all patients grip strength scores of the affected hand were markedly lower than that of the unaffected hand, see Table 8 . Scores of grip strength on the second assessment showed that those of the unaffected hand stayed almost the same, with a difference of 1.5 between the means, whereas the scores of the affected hand showed a considerable increase of 28.7 in the mean.

Criterion related. Other studies report using this and other similar dynamometers.

Reliability. Using the S.P.S.S. package, Pearson's product movement correlation was computed and showed that the relationship between first and second assessments of the unaffected hands were highly statistically significant .97 p = .000.

Dominance.

The question of dominance differences arose here. Fernando and Robertson (1982) found variation of between 6% and 8% between the dominant and non-dominant hands of their subjects, others do not report finding consistent differences, Kjerland (1953). In order to test whether account should be taken of the dominant or non-dominant hand, 20 healthy subjects age range 29-58, were asked to use the grip meter with both hands. The results showed that for 8 subjects similar readings were obtained for both hands, with variation between dominant and non-dominant being less than 5 mm. For 7 subjects the dominant hand scored between 10 and 60 mm more than the non-dominant hand but for 5 subjects the non-dominant hand was between 10 and 30 mm more than the dominant hand. Since no consistent dominant/non-dominant grip strength relationship was found, but consistent unaffected/affected

grip strength relationships were found, the differences between the two would be noted.

Discussion.

These results demonstrated that using the Boots' grip strength meter with both the affected and unaffected hands provided a suitably reliable method of monitoring change in grip strength in this group of subjects.

Because of the wide age range of subjects and the variety of their occupations, grip strength was not measured against a norm, each subject was used as their own standard, their contralateral hand being used as their norm - movement towards this 'norm' indicating a decrease in disability. This was considered acceptable because consistent differences were found in grip strength between the affected and unaffected hands, the affected hand being consistently lower. Increase in the strength of the grip of the affected hand was demonstrated. A difference score denoting the difference between grip strength of the affected and unaffected hands was used, this reflecting change in disability.

3. Localised Oedema.

Methods of measurement of localised swelling have included the use of complex equipment such as radio-isotope scanning using a Gamma camera Berry et al. (1978), measuring the circumference with a tape measure Kirwan et al. (1979) and measuring the volume of water displaced by the affected limb Eccles (1956). The use of complex equipment such as Gamma cameras is expensive and time-consuming and is not suitable for use in clinical situations.

Circumferential measurements are said to be only 'relatively reliable' Kirwan et al (1979) - there is always the problem of measuring an ellipse rather than a circumference, the tape tension often varies and it is difficult in a localised swelling to obtain exactly

the same position for repeated measurements. Measurement of displaced volume of water of a swollen limb appears to be the most satisfactory method: Eccles (1956) quotes the margin of error using his apparatus as less than 1%. The factors causing variation were identified as activity and rest, temperature, and time of day. Therefore this technique was explored in more detail with wrist group subjects.

Method.

Apparatus was developed consisting of a cylinder filled with water with an outflow pipe so that when the subject's hand was placed in the cylinder water displaced fell into a measuring jug, see Figure 3. Both affected and unaffected hands were measured to obtain a difference score.

Subjects.

N = 12, 10 female, 2 male, age range 32-70 years. Ten patients who had sustained a fractured wrist and been immobilised in a splint for 4-5 weeks with clinically observable localised swelling in the region of the wrist.

Materials.

See Figure 3.

Procedure.

Each subject was asked to place their unaffected hand gently into cylinder A until the web between the index and middle fingers rested on the bar B. The amount of water displaced into the measuring jug was noted. The cylinder A was refilled and the procedure repeated with the affected hand.

Results.

The scores obtained are given in full overleaf, see Table 9. The water displaced was measured in mls.

FIGURE 3

WATER DISPLACEMENT APPARATUS

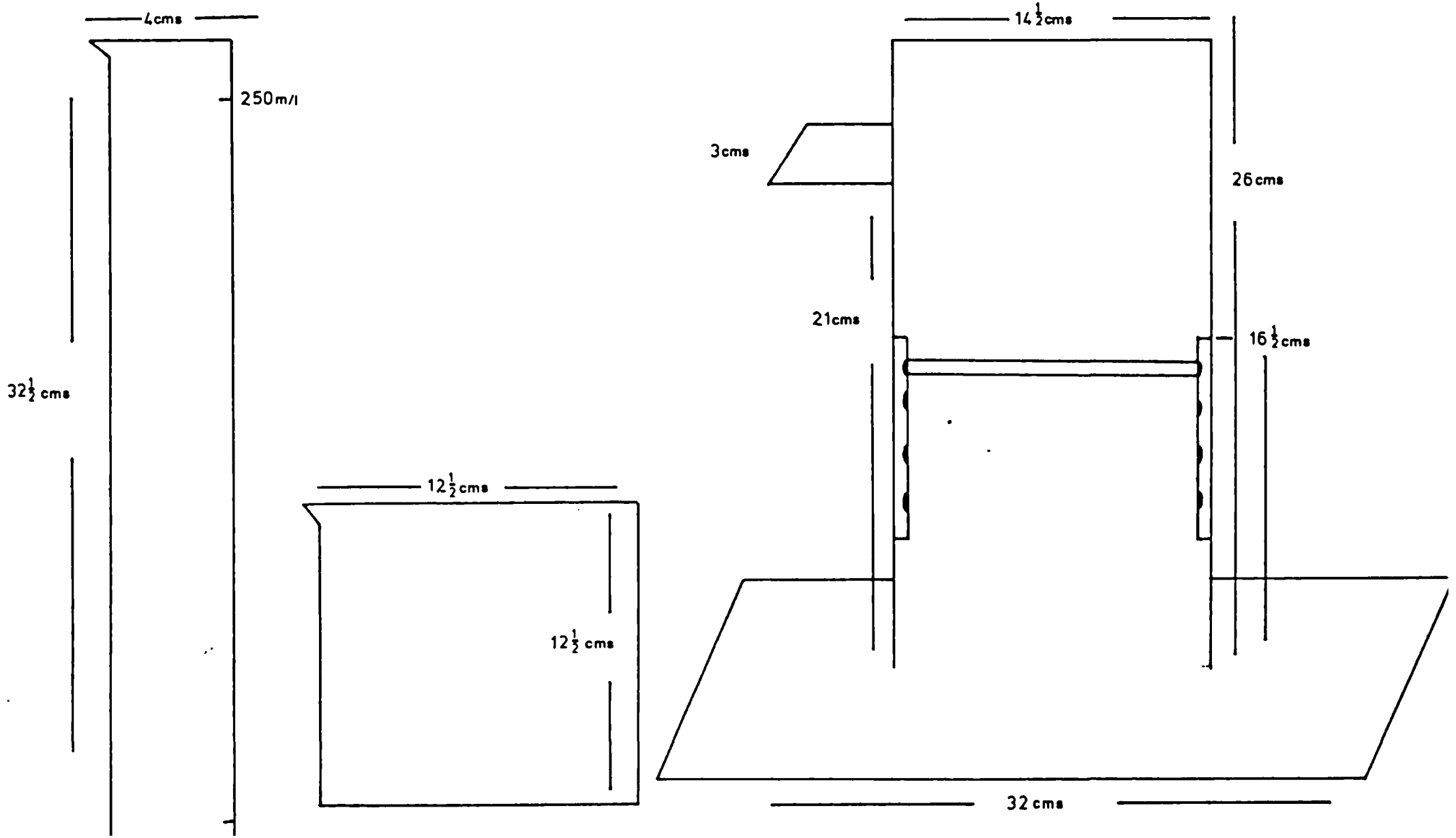


Table 9

	Water displacement	
Subjects	Unaffected hand	Affected hand
1	230	250
2	*320	298
3	232	351
4	250	270
5	255	352
6	*240	230
7	*253	230
8	300	450
9	*350	320
10	241	298
11	338	374
12	230	250

*indicates those where affected hand displaced less than unaffected hand.

Discussion

The difference scores for 8 subjects showed that the volume displaced by the affected hand was higher than that of the unaffected hand. For 4 subjects the unaffected hand displaced between 10 ml and 30 ml more than the affected hand.

Examination of the hands of subjects with clinically observable swelling but whose affected hand displaced less volume than the unaffected, showed marked muscle wasting of the muscles of the palm of the hand. Because the hand and wrist had been immobilised the muscles appeared to have wasted,this loss in some subjects being greater than the swelling. Therefore, this method of measurement does not provide a valid method of measuring localised swelling in this group of subjects, and therefore was not used. As no other suitable methods were available,

localised swelling was not monitored.

4. Pain.

'Despite the recent advances in understanding the physiology of pain, the role of endorphins and neurotransmitters, the assessment of verbal reports of clinical pain still remains difficult' Reading (1980). Physiological measurements of such things as respiratory rate, blood pressure, pupil size or sweating when used as correlates of pain, do not correspond well with subjective reports, which remain the main source of clinical information about pain.

A number of different methods have been used to monitor changes in clinical pain, rating scales Huskisson (1974), crossmodality matching Graceley (1978), card sort Reading (1979) and questionnaires Melzack (1975a),but the most commonly used method is self-report scales, verbal, visual or numerical. Downie (1978) found good correlation between pain scores derived from 4 different rating scales; and evidence that the 4 scales were measuring the same underlying pain variable.

The complex nature of pain cannot be described by rating scales alone, which only provide information about the dimension of intensity. Melzack (1975a)suggests that there are 3 major classes of word descriptors which reflect different aspects of the pain experience: sensory, what it feels like; affective, how it makes me feel; and evaluative, how intense it is. The wording of the McGill questionnaire (Melzack 1975a) reflects these three aspects but contains over 60 adjectives and administration time is lengthy.

Many of the scales for measuring pain have been developed to monitor changes in chronic intractable pain but the pain from many conditions such as that following a fracture is not continuous but exacerbated by activity and diminished or absent at rest. If the picture is one of fluctuating rather than continuous pain, then ratings of pain must be

related to the individual patterns of pain.

Information about a number of different aspects was sought. The temporal nature of the pain - whether it was constantly present or only occurred on movement. The characteristics of these 2 types of pain - if present - were examined. The extent to which pain disturbed sleep and the extent to which activities were disrupted were rated, and the use of analgesics noted. The use of these items were tried out with a group of subjects who had sustained a wrist fracture.

Methods.

Patients ratings of their pain were obtained, they were asked to describe the type of pain and aspects of pain related behaviour such as taking analgesics and sleeping pills and listed activities that pain stopped or interfered with.

Subjects.

N = 13, 11 female, 2 male, age range 50-85 years. Were patients who had sustained a wrist fracture and were attending hospital as outpatients for treatment.

Materials.

A form containing the following items with separate rating scales for questions 2-5.

1. Subjects report of presence of:

	a) constant pain	Yes/No
	b) episodic pain	Yes/No

Words used to describe pain were noted.

2. Severity of type of pain present:

Both constant and episodic pain rated as:	very severe	4
	severe	3
	not very severe	2
	not severe at all	1

3. Extent to which pain of either type disturbs sleep:

a lot	3
quite a lot	2
only a little	1
not at all	0

4. Taking sleeping pills and analgesics were rated as:

frequently

occasionally

not at all

5. Extent to which pain interferes with activities:

nothing	0
a few	1
quite a lot	2
almost everything	3

Procedure.

Each subject was asked each question on the form, the research worker completing the form. A card with the points on the rating scale was shown to the subject - they indicated which rating was appropriate at that time for them.

Questions were asked as follows:

1. Can you tell me about your pain - do you have it

   a) all the time Yes/No

   b) when you move your wrist Yes/No

   Can you describe what the pain feels like?

2. Can you indicate on this scale:

   a) how severe the pain you have all the time is - Very severe - severe - not very severe - not severe at all

   b) how severe the pain is when you move your wrist - Very severe - severe - not very severe - not severe at all

3. How much does the pain disturb your sleep?

4. How often do you take:

   a) painkillers

   b) sleeping pills

5. How much does the pain stop you doing?

Results.

The results of the reports of the patients are given in tables 10-14.

Table 10

Patient reports of Pain

	First Report		Second Report	
	On movement	At rest	On movement	At rest
Very severe	2	0	0	0
Severe	5	2	2	1
Not very severe	4	6	5	3
Not severe at all	2	2	6	4
None		3		5
	13	13	13	13

Words used to describe pain:

Constant pain was:-

dull, nagging, straining, toothache,

driving, throbbing, feeling like fire.

Episodic pain was:-

sharp, shooting, piercing, neuritis,

sharpish, sore, pronounced ache, acute.

Results (continued)

Table 11

Disturbs sleep

	First Report	Second Report
Quite a lot	2	1
A little	4	2
Not at all	7	10
	13	13

Table 12

Use of Analgesics

	First Report	Second Report
Frequently	2	0
Occasionally	3	2
Not at all	8	11
	13	13

Table 13

Use of Sleeping Pills

	First Report	Second Report
Frequently	4	1
Occasionally	1	2
Not at all	8	10
	13	13

Results (continued)

Table 14

Pain stops Activities.

	First Report	Second Report
Almost everything	1	0
Quite a lot	6	5
Only a few things	4	4
Nothing	2	4
	13	13

Validity of the methods used was examined:

Face Validity. Verbal descriptors used on the rating scales appeared appropriate to subjects and were easy to use.

Construct related validity. The purpose of the scale was to monitor recovery from pain. Ratings both of severity of pain and restriction of activity as a result of pain showed a change from the first to the second report, for each measure in the direction of reduction of painful symptoms and less restriction of activity. See Tables 11 and 14.

5. Performance of self-care activities.

Wrist subjects, unlike those in the Stroke Group who were in hospital, were at home and their individual situations varied considerably as did the help that was available.

Method.

Self-reports of performance were used as with subjects in Group 1 but no checking by observation was possible as subjects were living at home. Where possible (7) ratings were checked with relatives.

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Subjects.

N = 13, 2 male, 11 female, age range 29-72. Thirteen patients who had sustained a wrist fracture and were attending for treatment as out-patients.

Materials.

A form with the following 6 self-care items listed: feeding, washing, undressing, dressing, toileting and bathing.

1. Back to pre-injury level.
2. Manage unaided takes longer.
3. Manage unaided, considerable difficulty.
4. Need some help or don't/can't do.
5. Need a lot of help.
6. Don't/can't do.

Procedure.

The purpose of the form was explained. Each subject was asked to rate their performance of each activity. Each activity was rated at the lowest rate of any component part. Ratings were checked by going through the performance of each activity the previous day the subject describing how it was done. Where relatives were available performance was checked with them (5). Reports were collected on referral and at 4 weeks.

Results.

Presented in Table 15. A cut-off point was made between managed unaided with considerable difficulty and needed some help.

Needed help = 0

Independent = 1

Table 15

	Self care Scores		
	Mean	S.D.	Range
Assessment I	3.5	1.3	1-6
Assessment II	4.8	0.8	3-6

For the five subjects who attended for treatment with their relatives, relatives' reports of patient performance of self-care items were the same as those of the patient.

The validity and reliability of the scale was examined.

Face Validity. Subjects found the items central to their own personal care, and all were to some extent difficult to perform because of their condition.

Content Validity. The items covered a representative sample of self-care behaviour, and were those contained in all longer A.D.L. scales.

Construct related validity. The scale was constructed to measure recovery from disability i.e. restriction of limitation of performance of self-care activities. All subjects had some limitation of performance on first assessment - this either reduced (12) or the same (1) on the second assessment.

Internal Consistency. Scalogram analysis of the gradings obtained from the 13 patients on two occasions showed that they conformed to the conventional levels considered to indicate the presence of a Guttman Scale, with a coefficient of scalability of 0.63 and of reproducibility 0.86.

Reliability. There was no way of checking the reliability except with relatives (5). Where this was done, relative reports supported the subject reports. By recalling the tasks on specific occasion

Results (continued)

(the previous day) more accuracy was encouraged.

General Conclusions.

Work on development of methods of measurements demonstrated that the following tools of measurement were valid for the purpose of monitoring levels of physical disability. The extent of their reliability under the stated conditions was of an acceptable level.

Group I Performance of movements

1. Gross body movement scale.
2. Quality of movement scale
    a) arm
    b) leg

Performance of activities

3. Personal care scale.

Group II Performance of movements

1. Wrist movements
    a) flexion extension
    b) radial and ulnar deviation
    c) pronation supination
2. Hand grip

Performance of activities

3. Personal care scale
4. Patient reports of pain.

Measurement of localized oedema will not be attempted as investigations demonstrated that methods available did not provide a valid measure of localized swelling for these subjects, nor were measures of circumference sufficiently reliable. These measures

were used to monitor recovery from physical disability in the selected groups and this work is described in the next Chapter.

Chapter III

Monitoring Recovery from Physical Disability.

This chapter reports the results of monitoring 40 subjects during the process of recovery from physical disability using the methods described in the previous chapter. It includes summaries of raw data and later analyses.

.....

Subjects.

In order to investigate the process of recovery from physical disability, a group of 40 subjects were selected with physical disability arising from stroke or a wrist fracture. The characteristics of the study population in terms of their condition are described fully in Section 1 Chapter 2, p.14 . Twenty subjects had suffered a stroke with a residual hemiplegia, hereafter referred to as the 'Stroke group'. Twenty subjects had sustained a fracture of the wrist, hereafter referred to as the 'Wrist group'.

All subjects could comprehend written and spoken Englsih and converse in English.

Age Range: Stroke Group 56-82 Mean 70 years

N = 20 Female 14 Male 6

Wrist Group 50-85 Mean 69 years

N = 20 Female 18 Male 2

These subjects formed the study population for the following experimental work unless it is specifically stated that this was not the case.

All subjects were seen on referral to the hospital physiotherapy department before the start of treatment when the first interview and assessment took place. Subsequent assessments were

different for the two groups as follows:

Stroke group.

Assessment I	Assessment II	Assessment III
Prior to treatment	6 weeks later	12 weeks from start

These subjects exited from the study on their discharge from hospital or at 12 weeks, whichever occurred first.

Wrist group.

Assessment I	Assessment II
Prior to treatment	4 weeks later.

Results are given of monitoring changes in clinical indices of physical disability at the stated time periods. The results are given separately for the two groups as different clinical indices were monitored.

Results.

Movement Scores - Stroke Group.

There were four movement variables for stroke patients, gross body movement disability, (GBM Dis.), gross body movement independence, (GBM Ind.), quality of arm movement, (QA) and quality of leg movement, (QL).

The means, standard deviations and ranges of the scores on the four movement variables and personal care are given in Tables 16 and 17. Full raw data are given in the appendix p233.

Table 16

Movement Scores (raw scores).

	Assessment	Mean	Range	S.D.
G.B.M. Dis.	I	6.1	5-7	1.7
	II	6.8	6-7	1.6
	III	6.9	6-7	0.26
G.B.M. Ind.	I	1.3	0-6	1.5
	II	3.7	1-7	2.6
	III	4.7	1-7	2.5
Q.A.	I	1.7	0-8	2.8
	II	2.4	0-8	3.2
	III	3.3	0-8	3.2
Q.L.	I	2.1	0.5	1.5
	II	3.8	0-6	1.8
	III	3.5	0-5	1.5

G.B.M. Dis. = Gross body movement disability

G.B.M. Ind. = Gross body movement independence

Q.A. = Quality of arm movement

Q.L. = Quality of leg movement

Table 17

Activity Scores.

Personal care	I	10.9	6-16	2.5
	II	14.7	10-24	3.4
	III	15.6	2-24	5.2

For assessments I & II n = 20

" " III n = 14

One of the problems in examining recovery in this group of subjects was that because of the differing initial levels of disability there was a wide range of starting scores and therefore more change was possible for those with lower starting scores. To normalize the data and take into account the different starting positions, the raw scores were transformed into arc sin scores, Diem and Lentner (1970). The best transformation for stabilizing the variance of the binomial distribution where n x p 1 is X = Arc Sin (α/n+1) + Arc Sin (α+1/n+1). The transformation is suitable for use in analyses of variance. Arc sin scores were calculated by obtaining the square root of each score, then the inverse sin of the square root, the final score obtaining being expressed in degrees. Arc sin scores were used for both groups of subjects in all analyses unless otherwise states. Means, ranges and standard deviations of arc sin scores are given in Table 18.

Table 18

Movement Scores (Stroke) arc sin scores.

	Assessment	Mean	Range	S.D.
G.B.M. Independence	I	17.95	0-66	19.4
	II	47.5	0-90	31.3
	III	60.1	0.90	30.8
G.B.M. Disability	I	71.1	57-90	11.5
	II	85.2	66-90	9.8
	III	88.2	66-90	6.4
Quality Arm Movement	I	18.3	0.90	29.7
	II	26.9	0-90	35.1
	III	37.6	0-90	38.4
Quality Leg Movement	I	33.1	0-55	20.9
	II	51.9	0-90	24.6
	III	44.2	0-66	22.0
Personal Care	I	18.5	0-53	19.6
	II	37.9	0-65	18.1
	III	49.5	0-65	22.1

Movement scores - Wrist group.

For each subject scores were available on six movement variables. The scores representing the difference between the range of movement of the affected and the unaffected wrist. In order to find if some of the movement scores could be combined to facilitate analysis by providing a smaller number of movement variables, factor analysis of the scores on the six movement variables was undertaken, using the BMDF 4M programme from the Health Sciences Computing facility at the University of California Los Angeles 90024 - revised 1979 programme.

The unrotated and rotated factor loadings are given below.

Unrotated factor loadings (pattern) for principal components.

Movements.	Factor 1	Factor 2	Factor 3
Flexion	.57	-.40	.55
Extension	-.23	.77	.54
Radial deviation	.47	.57	-.43
Ulnar deviation	.77	.19	-.42
Pronation	-.64	.49	-.25
Supination	.43	.67	.42
V.P.	1.79	· 1.73	1.21

The V.P. for each factor is the sum of squares of the elements of the column of the factor loading matrix corresponding to that factor. The V.P. is the variance explained by the factor.

Rotated factor loadings.

Movements.	Factor 1	Factor 2	Factor 3
Flexion	0.81	-0.06	0.08
Extension	-0.24	-0.17	0.88
Radial Deviation	-0.18	0.82	0.17
Ulnar Deviation	0.22	0.87	0.08
Pronation	0.82	-0.11	0.16
Supination	0.18	0.35	0.8
V.P.	1.62	1.6	1.5

The three factors linked the movement variables as follows; flexion and pronation (flex/pro), radial and ulnar deviation (Ud/Rd) and supination and extension (sup/ext). To obtain a composite movement score the scores of the linked variables were added together and divided by 2. These three composite movement scores were used in all subsequent analysis. The linking of the particular variables might have been expected on an anatomical and a movement basis. The composite scores are given in Table 19.

Table 19

Composite Wrist Movements.

Scores expressed as arc sin scores.

	Assessments.	Mean.	Range.	S.D.
Movement 1	I	51.4	39-64	6.6
Flexion/Pronation	II	57.8	44-71	6.2
Movement 2	I	50.7	30-66	10.6
Ulnar/Radial Deviation	II	59.5	39-73	9.7
Movement 3	I	47.2	21-70	11.0
Supination/Extension	II	55.5	42-70	10.4
Hand Grip	I	37.7	22.57	13.0
	II	46.45	30.58	15.6

The scores are difference scores and represent the range of movement of the affected hand as a percentage of that of the unaffected hand. Therefore higher scores mean that the movement of the affected hand is nearer to that of the unaffected.

Personal Care	I	48.2	41-57	4.6
	II	63.0	50-90	9.2

Pain reports and ratings are given in Table 20.

Table 20

Pain measures - (Wrist).

Pain Reports.

	Very Severe	Severe	Not very severe	Not severe at all	None	Totals
First Report						
Constant Pain	0	7	0	0	13	20
Episodic Pain	0	7	10	3	0	20
Second Report						
Constant Pain	0	3	6	0	11	20
Episodic Pain	0	6	9	4	1	20

Disturbs Sleep	A lot	Quite a Lot	A Little	Not at all	
1st Report	0	4	7	9	20
2nd Report	1	0	8	11	20

Use of Analgesics	A lot	Frequently	Occasionally	Not at all	
1st Report	0	2	4	14	20
2nd Report	0	1	6	13	20

Taking Sleeping Pills					
1st Report	0	5	0	15	20
2nd Report	0	3	1	16	20

Pain Stops Activities	Almost Everything	Quite a Lot	Only a few Things	Nothing	
1st Report	2	7	8	3	20
2nd Report	1	2	13	4	20

Attainment Scores.

To examine the extent of recovery from physical disability during the period of entry into the study to exit, attainment scores were calculated of clinical indices for each subject. This method was used rather than the end scores themselves to take into account the considerable variation in the starting scores of the subjects in both groups.

Six attainment equations were developed, two for stroke subjects, attainment scores of gross body movement disability and independence, and four for wrist subjects attainment scores of the three composite movements and hand grip.

Each attainment score for each subject was obtained by taking into account the starting score of that clinical index and other clinical indices which were related (details are given below with the equation).

Predicted scores were calculated for the stroke group using the following equation for each subject:

$$y = \alpha_1 b_1 + \alpha_2 b_2 + \alpha_3 b_3 + \alpha_4 b_4 + c$$

where for predicted score GBM Ind

α_1 = beginning score GBM Ind

α_2 = beginning score GBM Dis

α_3 = beginning score Quality arm movement

α_4 = beginning score Quality leg movement

b = group weights (regression co-efficients)

c = group constant

For predicted score GBM Dis, α = beginning of scores of GBM Dis, GBM Ind, arm movement and leg movement.

It had been thought originally that factors such as age, side of stroke, the presence of sensory problems might have been influential but for this group of subjects early analyses showed that they were not.

For wrist group subjects predicted scores were calculated for the 4 clinical indices, composite movements flexpro, UD/RD, Sup/Ext and Grip using the equation above. Factors such as dominance were considered for inclusion for these subjects, were not found to be significant.

The weights were the regression co-efficients obtained by regression analysis performed using MULREG - a general stepwise multiple regression programme - Garside (1981). The attainment scores relate to the typical progress of these groups of subjects. A score greater than 1 indicated more recovery than expected, less than 1 indicated less recovery than predicted. These attainment scores were used in later analyses.

Raw data are given in the appendix, scatter plots of the scores are given in Figures 4 and 5.

Scores of 1 indicate that actual score obtained was the expected score, greater than 1 indicates a higher score than expected, less than 1 a lower than expected score. The numbers falling into these

FIGURE 4

ATTAINMENT SCORES STROKE GROUP

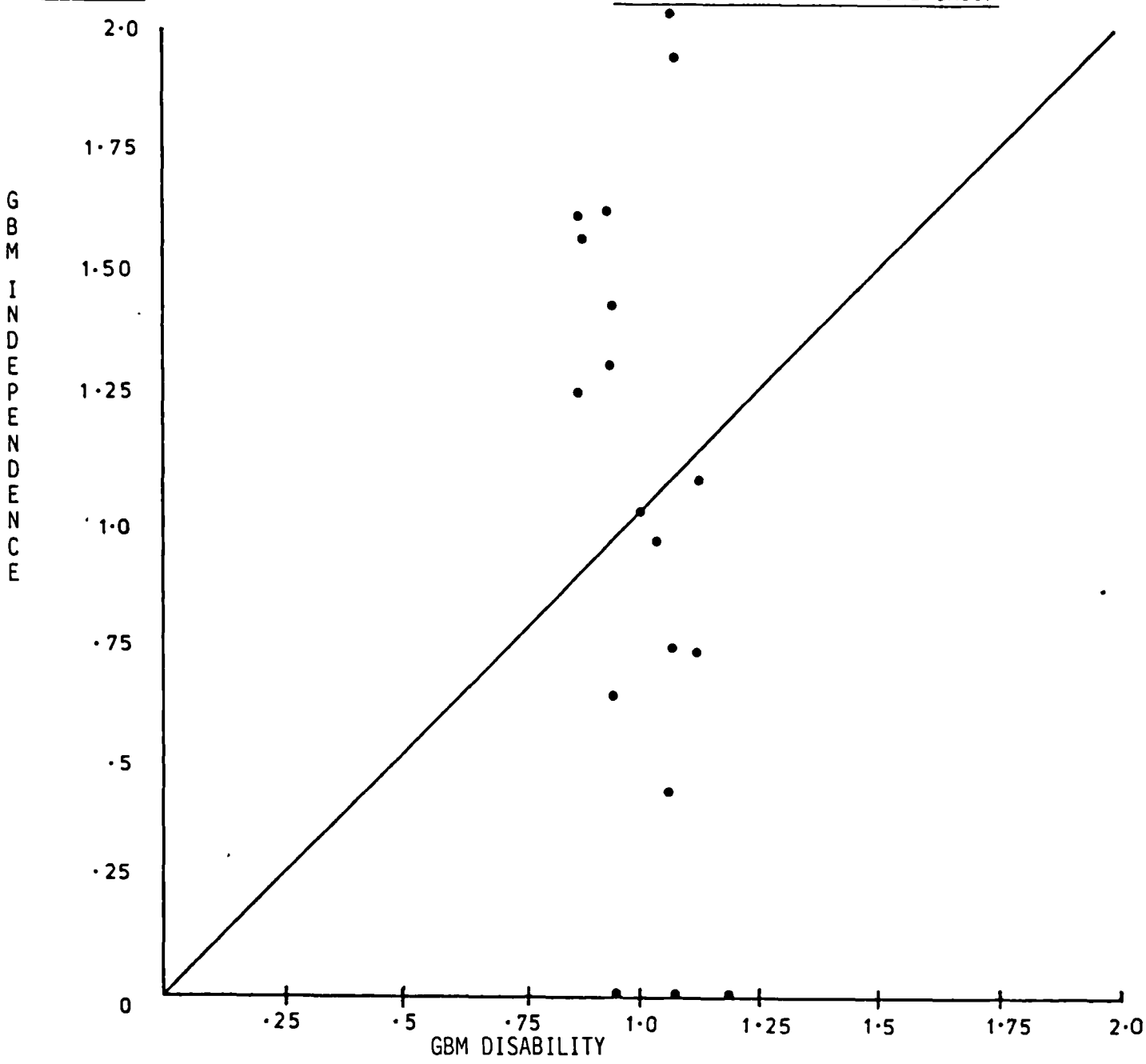
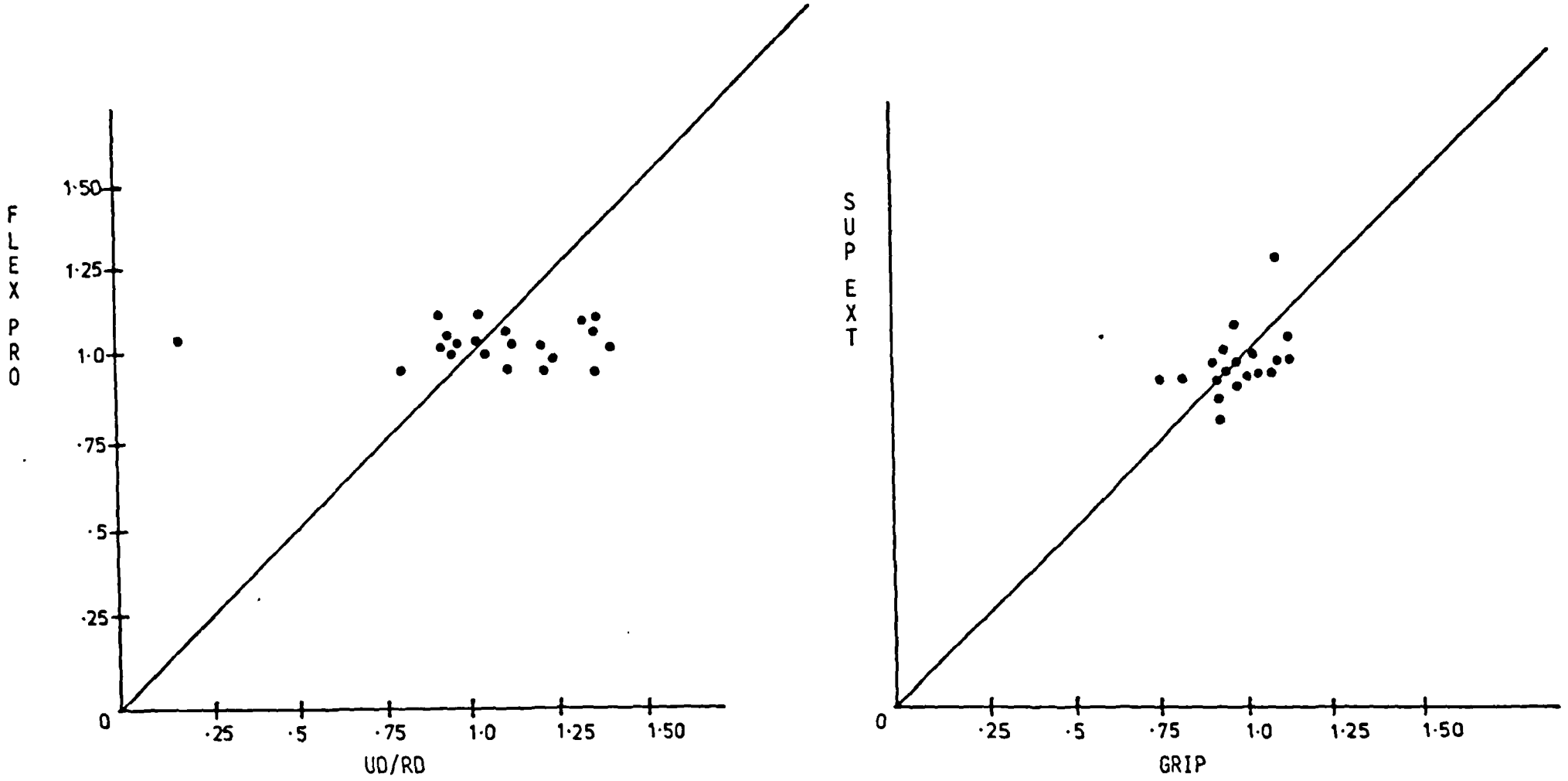


FIGURE 5

ATTAINMENT SCORES WRIST GROUP



categories are given below in Table 21.

Table 21 — Attainment score groupings

Number of subjects obtaining scores.

Stroke Group	Less than expected	As expected	Greater than expected
G.B.M. Independence	9	1	10
G.B.M. Disability	8	1	11
Wrist Group			
Flex/pro.	6	0	14
U.D./R.D.	6	0	14
Sup./Ext.	11	0	14
Grip	10	0	10

Correlations between movement scores.

Spearman's correlation co-efficients were computed between all movement scores in both groups at each assessment using the statistical package for the social sciences. (Nie et al. 1975). Pain scores for wrist group subjects are included in the correlation matrices for this group. The intercorrelations between initial and later scores are also given in Tables 22 and 23.

Table 22

Correlations between movement scores. (Stroke).

Assessment I	G.B.M. Ind.	G.B.M. Dis	Q.A.	Q.L.
G.B.M. Ind.		.62*	.60*	.56*
G.B.M. Dis.			.21	.58*
Q.A.				.55*
Assessment II				
G.B.M. Ind.		.25	.51*	.65**
G.B.M. Dis.			.22	.56*
Q.A.				.45*
Assessment III				
G.B.M. Ind.		.27	.08	.05
G.B.M. Dis.			.26	.40*
Q.A.				.32

* $p<.05$

** $p<.01$

G.B.M. Ind. = Gross Body Movement Independence.

G.B.M. Dis. = Gross Body Movement Disability.

Q.A. = Quality of arm movement.

Q.L. = Quality of leg movement.

Table 23

Correlations between movement scores also including pain scores. (Wrist).

	Sup. Ext.	UD/RD	Grip	PAIN Constant	PAIN Episodic
Assessment I					
Flex./pro.	.31	-.09	.22	.63**	.66**
Sup./Ext.		-.16	.52*	.66**	.78**
U.D./R.D.			.04	.67**	.70**
Grip				.47*	.72**
Assessment II					
Flex./pro.	.11	-.08	.04	.72**	.71**
Sup./Ext.		.13	.53*	.82***	.83***
U.D./R.D.			.07	.82***	.81***
Grip				.94***	.95***

* $p<.05$

** $p<.01$

*** $p<.001$

Table 24

Correlation of Initial and Later Scores.

Stroke group.

	Movements.			Personal Care.		
Assessments 1	with 2	1	with 3	P. Care 1	P. Care 2	P. Care 3
G.B.M. Ind.	-.01		.69**	.46*	.58**	.42*
G.B.M. Dis.	.09		.06	.28	.40*	.17
Q.A.	.91***		.08	.47*	.48*	.60**
Q.L.	.78***		.02	.44*	.56**	.48*

Wrist group.

Flex/Pro.	.56**	No	-.20	-.01	No
U.D./R.D.	.59**	Third	.43*	.03	Third
Sup./Ext.	.56**	Assess-	-.15	.26	Assess-
Grip	.3	ment	.34	-.01	ment

Table 25

Correlations between Initial Scores and Attainment Scores.

Stroke group.	Initial Score. with Attainment Score.	
	G.B.M. Ind.	.03
	G.B.M. Dis.	-.04
Wrist group.	Flex/pro.	-.10
	U.D./R.D.	.20
	Sup./Ext.	.06
	Grip	-.09

* p<.05
** p<.01
*** p<.001

Discussion.

The inter-correlations between the movement scores in the two groups showed different patterns. For the Stroke group initial scores were highly inter-correlated, but this decreased over the next two assessments. For wrist group subjects only one significant correlation was found, between the composite movement supination/extension and grip, and this held over both assessments. Highly significant correlations were found between movements, grip and pain scores on both assessments, it was not unexpected that limitation of movement was associated with pain, though from the design of this thesis, it was not possible to determine whether this relationship was causal, less movement because of more pain or a correlational one.

Though it would have been desirable to follow all stroke subjects for the full three months, within the time and financial constraints of this investigation it would not have been possible to bring all subjects back for a final assessment at three months, therefore they left the study on discharge from hospital. This resulted in six subjects having two assessments, 14 having three. The reasons for discharge are interwoven in a complex manner, social support and environmental factors often being more influential than clinical severity and therefore there is no reason for assuming that those who were discharged earlier represented a different sub-group and scores at discharge were not related to time since onset.

The main purpose of this section was to examine whether initial clinical severity would predict later severity. The results showed that overall, initial severity was not a good predictor of later disability and that the pattern was complex. In the stroke group neither initial gross body movement scores predicted scores at six weeks, but initial scores were correlated with one gross body movement score at

three months, but not with the other. A different picture emerged for the quality of arm and leg movement, here, there were significant correlations between initial and six week scores, but these correlations had disappeared by three months.

For the wrist group, the three initial movement scores significantly correlated with the same movement scores at four weeks. However grip scores showed no such significant relationship. The relationship between performance of movements and performance of activities was different in the two groups of subjects. For the stroke group initial movement scores were on the whole significantly related to personal care scores but this was not so for wrist group subjects.

The initial movement scores showed no significant relationships with attainment scores in either group. Whether a subject achieved more or less than might have been expected was not related in any of these subjects to initial severity of disability.

In general for these subjects initial severity was not a reliable predictor of later severity and there was considerable unexplained variance between initial and later scores of disability. The following chapters examine the extent to which psychological factors may predict recovery from physical disability.

SECTION III

Cognitions.

Introduction.

As physical severity alone did not provide adequate prediction of the process of recovery in these subjects with physical disability, the individual subject's cognitions were investigated and examined in relation to the process of recovery. The aspects covered in this section include cognitive appraisal, perceived locus of control, and coping. The subject's emotional response to the onset of their condition and the relationship between this and indices of recovery were examined.

Chapter 1

Cognitive Appraisal.

Introduction

Part I

The first part of this chapter outlines theoretical models relating cognitive factors and recovery from illness, and derives hypotheses. These are tested using data from the main study population and are presented in Part II of the Chapter.

.....

Lazarus et al, (1970, 1974) and Cohen and Lazarus (1979) suggest that cognitive factors are central in determining the impact of stressful events, and that the way an individual appraises and interprets the events in his life affects coping, emotional, physiological and behavioural reactions to stressful experiences; it would be generally recognized that illness would be appraised as a stressful experience. Other theoretical approaches such as the Personal Construct Theory of Kelly (1955), the Health Belief Model proposed by Becker et al. (1979) also stress the important role of individual perceptions on health related behaviour. Some of these theoretical approaches are examined and their relevance for the study of recovery from physical disability is discussed.

Experimental work with patients with physical disability is described and patients' appraisal of and perceptions about their condition is examined in relation to objective measurement of recovery variables.

Investigation of individual perceptions of the event of illness as a means of understanding illness related behaviour is a central

theme in a number of theories and models. Lazarus (1966) was one of the earliest workers in the field proposing that the key to understanding the impact of the stressful events lay through investigation of the individual's appraisal of the event, primary appraisal being evaluative, secondary appraisal including the appraisal of available resources and options. Mechanic's (1962) model, which has also been influential, emphasized the ways in which symptoms may be differently perceived and evaluated - this providing a basis for understanding illness behaviour. Kasl and Cobb's (1966) model also hypothesized that illness and sick role behaviour were directly influenced by the individual's perception of the threat of the disease or condition.

Lipowski's (1969) framework for understanding psychological aspects of illness and disability proposed a wide range of different ways in which an individual may perceive their condition, this based on observation in clinical practice. A more sophisticated model the Health Belief Model (HBM) has been put forward by Maiman and Becker (1974) and elaborated by others. The HBM proposed that perceived seriousness of the symptoms and perceived susceptibility to the disease are central in determining subsequent behaviour. Three of the above models are considered to have particular relevance for this thesis on recovery from disability, and are discussed in more detail.

1. Lipowski.

In 1970 Lipowski proposed a conceptual framework for the clinical study of psychological aspects of physical illness where physical illness or disability was conceived as a form of psychological stress involving threat of suffering or losses. This model stresses the importance of the meaning of the illness to the individual and its personal subjective significance. It is posited that any individual will experience and respond to a given episode of disease or trauma in a unique way, the response determined by a number of variables.

Four classes of variables are proposed for explaining the individual psychological response to disease or injury - personality and relevant aspects of life history, the current social and economic situation, the characteristics of the non-human environment, and most importanly the perceptions and evaluations the individual has about the nature and characteristrics of the pathological process, injury or physical disability.

The psychological response itself is seen as having three dimensions, the intra psychic experiential, the behavioural, and social or interpersonal. The key psychological concept is the meaning of the event for the individual, the process of evaluation which is part of meaning begins with the first perception of a pathological process or injury and carries on throughout the course of the illness and its sequelae. The perception and appraisal of the illness and its meaning is a cognitive process but not necessarily rational or conscious.

Within this framework seven possible appraisals of illness are suggested, each having different implications for behaviour. They are as follows, with illness being perceived as:

1. Challenge - tasks to be mastered
2. Enemy - invasion by harmful forces
3. Punishment - just or unjust
4. Weakness - a sign of failure
5. Relief - respite from life's demands
6. Irreparable loss or damage
7. Value or opportunity for growth and development.

Coping strategies used to deal with the illness and its associated problems are expected to vary with the differing appraisals which may themselves change over time.

Evidence.

Experimental evidence to support this framework is not given by the author, nor are other experimental studies cited; descriptive studies of severely disabled patients such as those of Visotsky et al (1961), of patients with disability following poliomyelitis, and Hamburg et al. (1953) of patients with disabilities following severe burns, are used to illustrate the model.

Evaluation.

Though this model is very weak in that it provides no supporting empirical evidence, it is one of the very few which addresses itself particularly to the problems of conditions involving physical disability. It provides a global approach to the problem and highlights ways in which individuals may perceive their physical disabiliyt; the emphasis on personal meaning of events rather than the events themselves, suggesting that cognitive factors are influential in illness and during the process of recovery.

2. Lazarus.

This model proposed in 1966 considered the cognitive process of appraisal as the basis for understanding the individual response to illness and is supported by experimental evidence. Appraisal in Lazarus and Launier's (1978) later cognitive phenomenological analysis consists of a continuously changing set of judgements about the significance of the flow of events for a person's wellbeing. They suggest their concept of appraisal differs from the 'cold' perception or appraisal of Arnold (1960) in that it is evaluative in a personal sense. The two components of appraisal are defined by Lazarus (1966) as primary and secondary; primary referring to the evaluation of what is at stake for the individual, secondary also taking into account

individual coping resources and available options. The two processes are not necessarily seen as sequential but as part of a continuous process each in turn affecting the other.

Within this model primary appraisal may suggest that the event is irrelevant, having no implications for the individual's wellbeing, that it is benign signifying a positive state of affairs where no coping or adaptation is required, or harmful in some way posing a threat for the individual - only in these circumstances when the event is appraised as harmful does secondary appraisal and consideration of coping resources take place. The event that is primarily appraised as harmful may on secondary appraisal be perceived differently. Lazarus (1966) differentiated between threat and challenge on the grounds that threat emphasizes the potential harm, challenge the positive mastery or gain. The appraisal processes are not necessarily seen as conscious or deliberate, they may also be unconscious or on the fringe of consciousness as in Weisman's (1972) middle knowledge.

Evidence.

Lazarus et al. (1970) suggest there are four basic areas of empirical research which help in understanding the processes of cognitive appraisal and re-appraisal. Firstly by direct manipulation of the way in which subjects interpret events, and they cite Lazarus et al's (1962) study where three sound tracks were created for a film of initiation ceremonies of adolescent Australian aborigines called 'Subincision rites', the tracks were i) trauma, ii) denial, and iii) intellectualisation. When the subjects were monitored viewing the film while listening to the different sound tracks, it was found that the autonomic and subjective response of subjects to the film differed when listening to the different sound tracks. Those listening to the trauma track had a higher autonomic response and reported higher subjective stress than those listening to the denial and

intellectualisation tracks.

When Lazarus and Alfert (1964) modified Speisman's approach by transforming the three sound tracks into orientation passages played to subjects before viewing the film, essentially the same results were obtained with the three groups.

Other experimental investigations have also shown that appraisal of an event can be manipulated, Orne (1962) demonstrating it by changing the demand characteristics of the situation, Schachter (1967) by providing alternative interpretations for his subjects' reactions, while Harvey (1965) altered the adaptation level or base-line against which incoming stimuli were evaluation, all these different manipulations altered the way in which subjects appraised events.

Secondly, it is suggested that the role of appraisal and re-appraisal in producing or reducing stress can be studied by the manipulation of variables on which the cognitions depend. Stress reactions tend to mount as the moment of confrontation approaches, this tendency has been shown to vary considerably with the duration of anticipation by Nomikos et al (1968). Individual differences in defensive style in response to stress were examined by Goldstein et al (1965) and relationships between stress reactions and cognitions were demonstrated.

Thirdly, inferences can be obtained from self report data. Subjects in Lazarus et al's (1962) study were interviewed after viewing the 'Subincision rites' film (see p.) and the three basic patterns of response reported were emotional flooding, intellectualized detachment and denial. This reflecting the different types of response if a similar event is perceived in different ways.

The fourth method suggested for investigating appraisal and re-appraisal involves the selection of subjects who differed in their emotional predispositions, such differences due to biological, cultural

or psychological factors; Andrew (1967) studied patients before surgery for inguinal hernia, and divided them into three groups based on their defensive style or disposition. Each group was then given either factual or instructional statements, the pre-treatments produced different results with each gorup - avoidant patients had retarded recovery if given instructional statements about their forthcoming operation, non-specific defenders were facilitated in rates of post-operative surgical recovery if given the factual statements, the pre-treatments influencing individual appraisal.

In their study of coping with the stressful events of daily life Folkman and Lazarus (1980) provide further support for their theory, they reported that one of the most potent factors influencing coping was how the event was appraised.

Appraisals were:

a) you can change or do something about

b) that must be accepted or gotten used to

c) that you needed to know more about before you could act

d) in which you had to hold yourself back from doing what you wanted to do.

It was reported that subjects who described their appraisal of the situation as one where something could be done and in which more information was needed, generated higher levels of problem focussed coping.

Evaluation.

The studies mentioned above support the hypothesis of a relationship between cognitive appraisal and behavioural and emotional responses, though the evidence for a differentiation between primary and secondary appraisal is less clear. Because the approach is a cognitive phenomenological analysis few hypotheses are available which can be used to test the model, however, the framework is useful when examining cognitive

appraisal as a factor in recovery from physical disability.

III The Health Belief Model.

The third, more detailed and explicit model was developed during the 1950's by Hochbaum, Kegeles, Levanthal and Rosenstock (1979). Its purpose was to explain the likelihood of an individual's undertaking a recommended preventive health action such as obtaining immunization and participating in screening programmes for early detection of asymptomatic disease. The model is based on decision making concepts of the attractiveness of the goal to the individual and the personal estimate of the likelihood of goal attainment. The theory argues that whether or not an individual will undertake a recommended health action depends on four aspects:

1. The perceived level of personal susceptibility to the particular illness or condition.
2. The perceived degree of severity of consequences (organic and/or social) which might result from contracting the condition.
3. The perceived potential benefits or efficacy of the health action in preventing or reducing susceptibility and/or severity.
4. The perceived physical, psychological, financial and other barriers or costs related to initiating or continuing the advocated behaviour.

The individual perception of events is also crucial in this model which stipulates that a cue or action stimulus must occur to trigger appropriate behaviour by making the individual consciously aware of feelings about the health threat; these cues being internal to the person, i.e. perception of symptoms, or external. The original Health Belief Model was revised by Becker and Maiman (1975) to include:

1. General health motivations based on measures of health concerns,

practices and beliefs about prevention that are relatively non specific and stable across situations.

2. Re-susceptibility to illnesses previously contracted.
3. General faith in physicians and medical care.
4. Characteristics of the doctor-patient relationship.

Evidence.

Empirical evidence of support lacking in the previous two models is available here, for example Becker et al (1974) tested the H.B.M. in childhood obesity with interview schedules that contained items specifically designed to operationalize dimensions of the H.B.M. The results demonstraated that factors which showed a strong relationship to weight loss were, general health motivation of the mother and the extent to which the mother was concerned about the child's health. The perceived susceptibility of the child as perceived by the mother was consistently correlated with weight loss, and appointment keeping and perceived severity or potential severity was associated with more compliant mothers. Overall these authors suggest that the H.B.M. appeared to be useful in predicting a mother's adherence to a diet regimen prescribed for her child.

Haynes et al (1976) tested the H.B.M. with patients with hypertension; this study reported that pre-treatment beliefs tested before initiation of drug treatment did not predict compliance 6 and 12 months later. However, health beliefs expresses at 6 months after start of treatment were found to be consistent with compliance measured at the same point in time and also predictive of subsequent 12 month compliance. This supporting the hypothesis that health beliefs, instead of preceding and determining compliance behaviour, develop along with compliance behaviour as a result of experience with treatment gained by the patient during the early stages of treatment.

The importance of individual perceptions and beliefs and their effect on behaviour is central to this model of health behaviour. It differs from the previous two in that it is suggested that appraisal and individual perceptions must become conscious as a cue to action. In an investigation of selected approaches and models used to explain health actions, Cummings et al (1980) asked expert judges to partition a set of 109 variables representing 14 different models, and found using Smallest Space Analysis that six interpretable factors emerged:

1. Accessibility to health care.
2. Evaluation of health care.
3. Perception of symptoms and threat of disease.
4. Social network characteristics.
5. Knowledge about the disease.
6. Demographic characteristics.

Evaluation.

The basis for undertaking recommended health action within this model depends on individual perceptions of different aspects and it is this emphasis that is of interest in this thesis.

These three models all suggest that cognitive factors are central in determining behaviour which follows stressful events such as illness. The meaning of the event for the individual, the way in which they appraise it, and individual perceptions of all aspects of the event are hypothesized as having important influences on subsequent behaviour.

Cognitive appraisal of physical disability.

The work previously discussed would suggest that subjective cognitive appraisal of physical disability would show considerable individual variation not necessarily strongly positively correlated with the objective degree of disability, since individual perceptions

would not be based on the objective phenomena but on individual appraisal of those phenomena.

Early exploratory work by Partridge (1983) also suggested that individuals vary considerably in their perceptions of levels of disability that to the observer appear similar. In analysing material obtained from interviews with subjects with physical disability some subjects with objectively severe restriction of movement and activity talked of the 'nuisance' of their condition while others with objectively much less severe restriction talked of the 'overwhelming' nature of their problems and the restrictions imposed by their condition.

Studies that have investigated the relationship between clinical morbidity as assessed by health professionals and patient perceived morbidity reveal considerable differences. Wilson Barnett and Fordham (1982) suggest that patient perceived morbidity and clinical morbidity are conceptually distinct; though generally regarded as correlated, there appears to be a degree of mismatching. Professional opinion of lung function based on objective criteria showed lack of correlation with patient perception of shortness of breath, Hale (1977), and reports of quality of sleep did not show correspondence with EEG sleep recordings - Kavey and Altshiler (1979). Johnston (1976) showed that when reporting patients' worries nurses rarely scored above the chance level in their knowledge of what was worrying the patient. In a later study Johnston (1982) reported finding that fellow patients were more accurate in their knowledge about patients' worries than were nurses. This all suggests a considerable gap between the health professional's appraisal of the patient and their illness and the subjective view of the individual patient.

Hypotheses.

On the basis of the work previously discussed a number of hypotheses were proposed about the relationships between individually perceived physical disability and objective measurements of limitation of performance of movements and functions which reflected physical disability.

1. That perceived seriousness would be a function of objectively measured severity, but with considerable unexplained variance.
2. That appraised seriousness of condition would be related to recovery variables, those perceiving their condition as more serious attaining lower levels of recovery and individual perceptions of seriousness being a predictor of recovery.
3. There would be considerable differences between the perceptions of individual patients and health professionals.
4. That degree of perceived change in self through the onset of illness would be predictive of type of recovery. Those perceiving themselves as more changed having a less beneficial recovery.

Introduction.

Part 2

This second part of the chapter examines the extent to which the hypostheses proposed in the first section are supported by the data obtained from the main study population of subjects with physical disability. The methods used are described and results presented and discussed.

.....

Examination of individual appraisal of perceived seriousness of condition.

Method.

Subjects were interviewed on first referral for physiotherapy treatment. They were asked a) to rate how serious they had perceived their condition to be at the onset, b) to rate their present perception of its seriousness at the time before starting treatment.

Subjects.

Main study population see p.14.

Materials.

A rating scale with the following four verbal descriptors printed on white cards 15 x 23cms.

VERY SERIOUS SERIOUS NOT VERY SERIOUS NOT SERIOUS AT ALL

Procedure.

At the start of the interview the subjects were asked to give the history of the onset of their condition - they were then asked to rate it retrospectively as follows:-

'Could you please indicate on this scale which represents most closely the way in which you saw your condition at that time'.

At the end of the interview, after approximately half an hour during which other assessments were made, subjects were again asked to rate the seriousness of their conditon as follows:

'How serious do you see your condition now, can you please indicate on this scale'.

Results.

The subjects' ratings retrospectively and on referral for treatment are given in Table 26 and illustrated in Figure 6. Correlations between ratings of perceived seriousness and objective assessments of seriousness at the same point in time were examined using Spearman's rank order correlation. Details are given in Table 27.

FIGURE 6

PERCEIVED SERIOUSNESS AT ONSET AND ON REFERRAL FOR TREATMENT

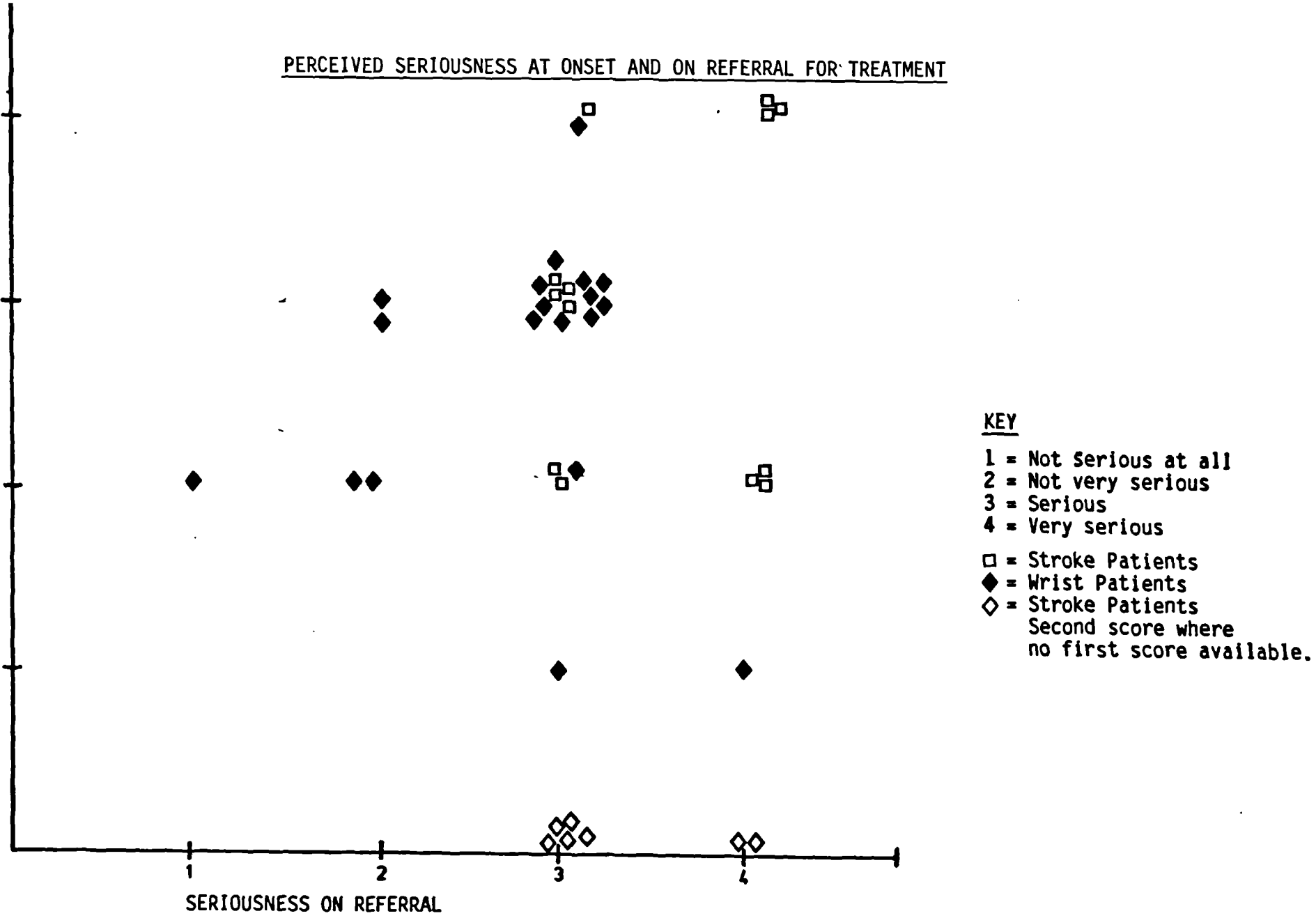


Table 26

Ratings of perceived seriousness of condition at onset and on referral.

Stroke Group	Very Serious	Serious	Not very Serious	Not Serious At All	Subject Total
At onset	3	4	5	1	13*
On referral	8	12	0	0	20
* 7 subjects were unconscious at onset.					
Wrist Group					
At onset	1	12	2	5	20
On referral	1	13	5	1	20

The correlation between first perception of seriousness at onset of physical disability with perception of seriousness on referral for treatment was investigaed using Spearman's rank order correlation, the rho of .30 found was not significant.

Table 27

Correlations between perceived seriousness and objective measures of seriousness (Spearman's Rho)

	Objective measures with rating of perceived seriousness at onset	
Stroke group	G.B.M. Ind.	-.09
	G.B.M. Dis.	.03
	Q.A. Movement	.06
	Q.L. Movement	-.02
Wrist group	Flex/Pro	-.08
	UD/RD	.27
	Sup/Ext	.63**
	Grip	.43*

* p>.05

** p>.01

Correlations between perceived seriousness and attainment were examined using Spearman's rank order correlation on the S.P.S.S. programme. Results are given in Table 28.

Table 28

Correlations between perceived seriousness and attainment

	Attainment scores with perceived seriousness	
Stroke Group	G.B.M. Dis.	.14
	G.B.M. Ind.	-.27
Wrist Group	Flex/Pro	.07
	UD/RD	-.38*
	Sup/Ext	-.04
	Grip	-.07

* p>.05

Discussion.

It was interesting to note that the range of ratings of seriousness covered by the two groups was similar, though objectively stroke would, a priority, be considered a more serious condition.

In general the hypothesis of perceived severity being a function of objectively measured severity was not supported. It may be that the greater than expected variance reflected the nature and extent of individual variations in perception in this group.

Over half of the subject's ratings of perceived seriousness differed from the first to the second occasion (see Figure 6), this supporting the work of Lazarus (1966) and Folkman (1984) on the continually changing nature of appraisal in the light of further information and knowledge.

In examin ing the relationship between individually perceived seriousness and the recovery attained, the lack of relationship in stroke subjects may not be surprising given the earlier lack of correlation between their perceptions and objective measures. Attainment scores in the main for wrist subjects were unrelated to perceptions of severity, though a low negative correlation was found between one movement score and perceived seriousness. It would appear that in this group of subjects perceiving a condition as more or less serious was not related to the type and extent of recovery from physical disability attained.

This could be interpreted in terms of Lipowski's suggestions of the different perceptions of illness, if perceived as more serious this might elicit different responses, for example as a challenge, and an opportunity for growth and development, or in terms of irreparable loss or damage. Perceiving one's condition as more serious may also either encourage and facilitate coping resources or because the tasks might seem too great, impair coping by an imbalance between demands and resources. The relationship is complex, and with a larger group of subjects the differences within a group of those who perceived their condition at the same level of seriousness could be explored. In this thesis individual ratings of perceived seriousness were not found to be predictors of recovery.

Patients and health professionals perceptions of patient's problems and progress during recovery.

In order to examine whether there were differences in the perceptions of individual patients and the professional staff treating them, two aspects were investigated from both points of view:-

a) the patient's main problems

b) perceptions of progress during recovery.

Method.

All subjects and the therapist treating them were asked at the same point in time a) to identify the patient's main problems, b) to rate the extent of progress to date.

Subjects.

The main study population see p. . The therapists treating them.

Materials.

Rating scale for perceptions of progress in recover as below:

Better			Worse	
A lot	A little	Same	A little	A lot

Procedure.

Patients in the study population and the therapists treating them were asked the following questions on two separate occasions:

a) i) Patients were asked 'What is your main problem?'

ii) Therapists were asked 'What do you see as this patient's main problem?'

b) i) Patients were asked 'Please indicate on this scale the extent to which you think you are now better, worse or the same'.

ii) Therapists were asked 'Please indicate on this scale the extent to which you think Mr/Mrs./Miss..... is now better, worse, or the same'.

Results.

The problems most frequently identified by patients and therapists are given in table 29.

Table 29.

Problems identified by patients and therapists.

Patients.	Therapists.
Not able to get about and do jobs and shopping (7)	Pain and movement problems (8)
Not able to get to the toilet (1)	Lack of strength (10)
Not looking after myself and get dressed (5)	Co-contraction problems (3)
Having to be in hospital (4)	Balance problems (7)
Not able to walk (5)	Abnormal movement patterns and spasticity (10)
Not able to do things on my own (5)	(These usually described more fully using technical language)

Numbers in paretheses indicated number mentioning that problem.

Results.

Progress ratings by patients and therapists on two occasions are given below in Table 30.

Table 30.

Progress Reports.

	Better		Same	Worse		No reply
	A lot	A little		A little	A lot	
Report 1						
Patients	5	25	10			
Therapists	3	33				
Report 2						
Patients	8	25	5	1		1
Therapists	12	22	1	1		4

Ratings were examined to find the extent to which patients' and therapists' reports of progress were the same, results are given in Table 31

Table 31

Congruence between patients' and therapists' reports of progress.

First Report.

	All patients	Stroke	Wrist.
Agreement	17 (42).	8 (40)	9 (45)
Therapists see more progress	16 (40)	10 (50)	6 (30)
Patients see more progress	7 (19)	2 (10)	5 (25)
	40(100)	20(100)	20(100)

Second Report.

Agreement	20 (50)	9 (45)	11 (55)
Therapists see more progress	12 (30)	9 (45)	3 (15)
Patients see more progress	3 (8)	2 (10)	1 (5)
No answer available	5 (12)		5 (25)
	40(100)	20(100)	20(100)

Percentages in parenthesis

Scatterplots of patients' and therapists' perceptions of progress are given in Figures 7 and 8.

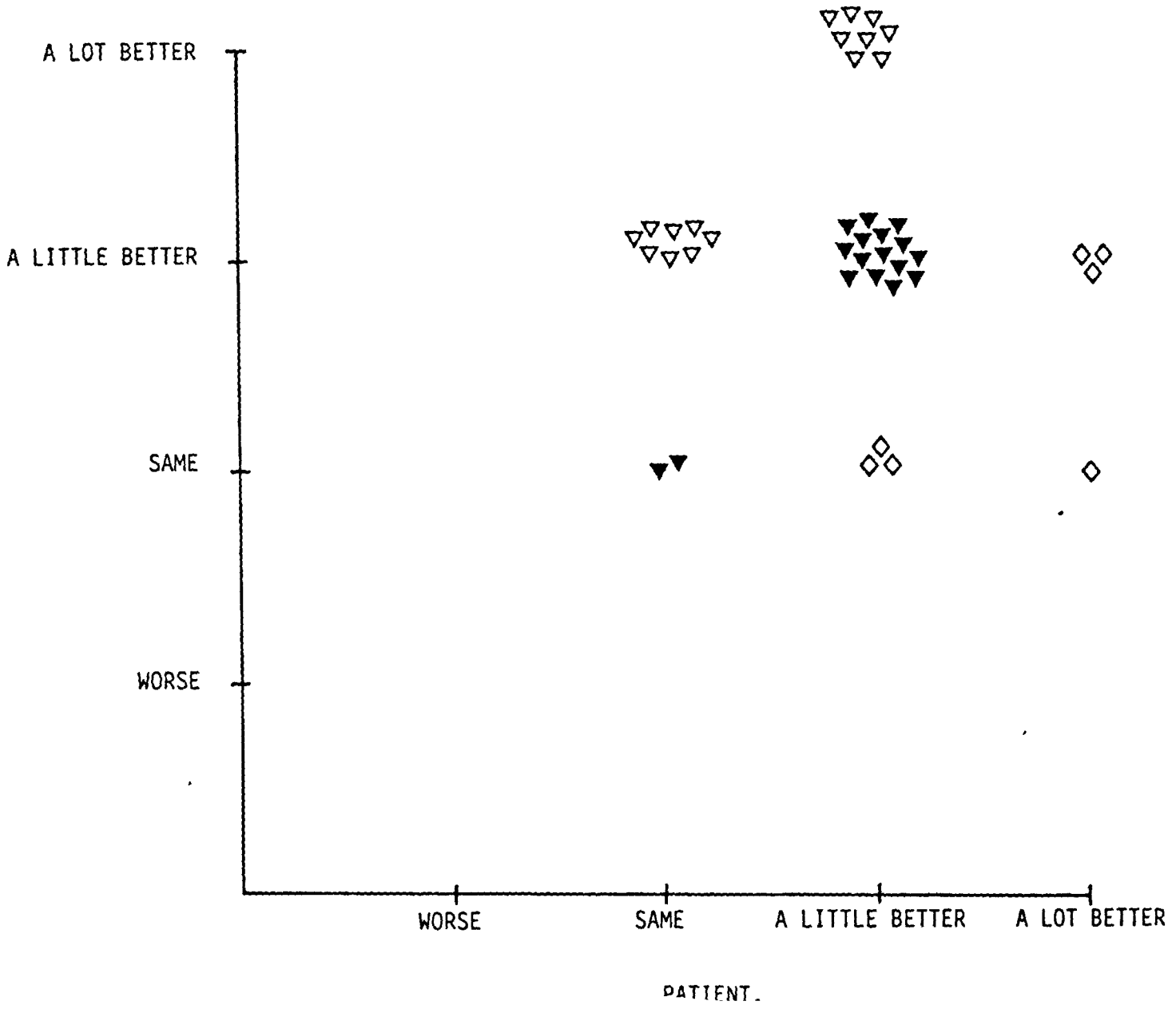
Discussion.

The results support the hypothesis of considerable differences in the perceptions of patients and professional staff. It was clear that the focus in the perceptions of the main problem was for the patients

FIGURE 7

SCATTERPLOT OF

THERAPISTS AND PATIENTS PERCEPTIONS OF PATIENT'S PROGRESS REPORT I



KEY

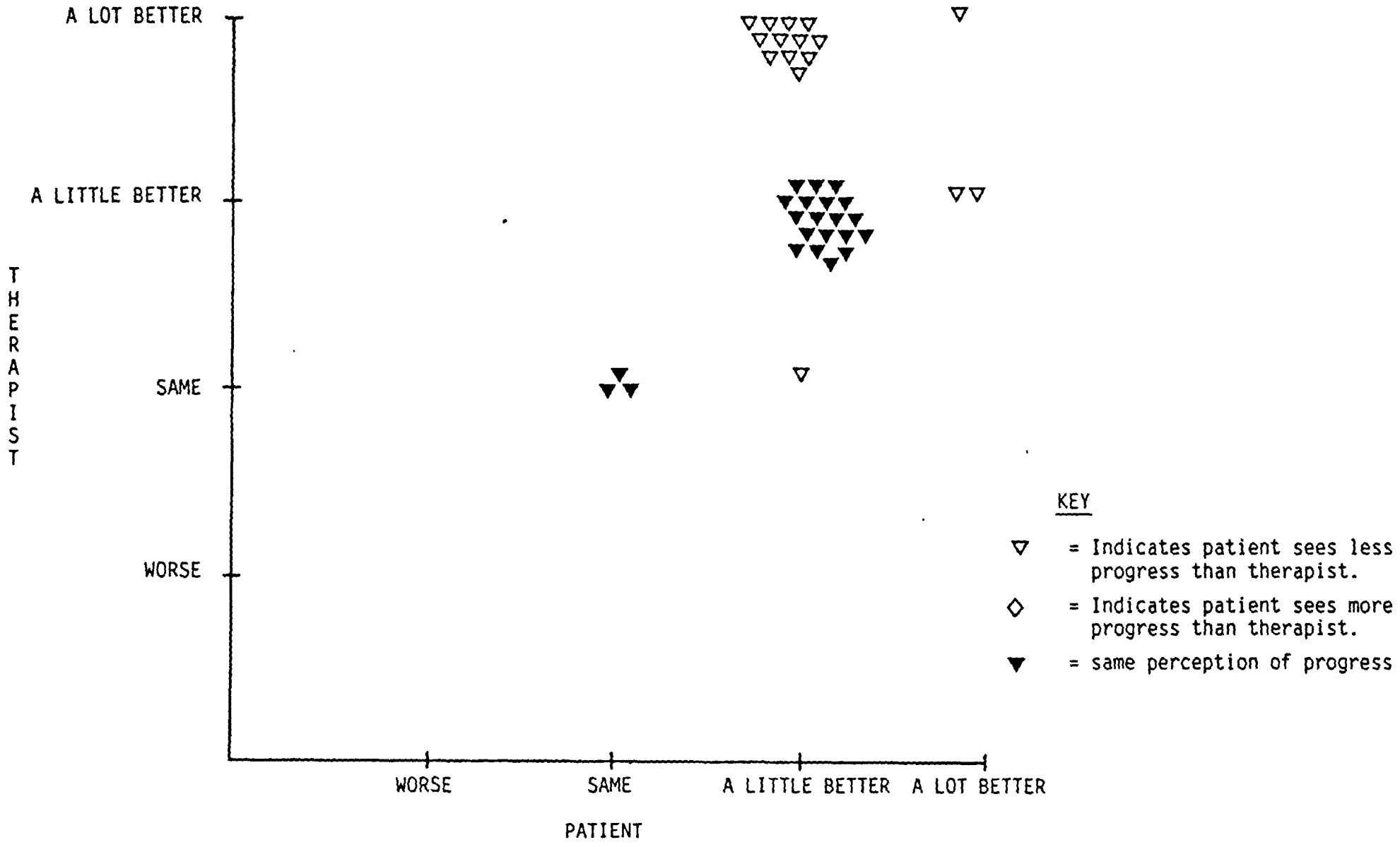
▽ = Indicates patient sees less progress than therapist.

▼ = Indicates patient sees more progress than therapist.

◇ = same perception of progress

FIGURE 8

SCATTERPLOT OF
THERAPISTS AND PATIENTS PERCEPTIONS OF PATIENTS PROGRESS REPORT II



on disability and handicap, on the functional limitations imposed by their condition, whereas the therapists focussed on impairment and disability specifically on problems towards which their treatment was directed. Given these wide differences, the variation in perceptions of progress were not surprising, it could be presumed that progress was seen in terms of changes in the main problems. This has serious implications for congruence between patients and therapists in treatment and management.

Examination of ways in which individuals saw themselves as changed through the onset of their condition

The method of using repertory grids to explore an individual's personal construct system is based on the work of Kelly (1955) who posited the notion of man as a scientist trying to make sense of the world about him. Exploring an individual's construct grid enables others to understand something of his personal view of the world. In order to develop grids for patients with physical disability, rating grids were developed.

It was hypothesized that patients who saw themselves as more changed through the onset of their condition, would have a more difficult and prolonged period of recovery and therefore attain less in the same time period than those who saw themselves as less changed.

Method.

To investigate ways in which subjects saw themselves as changed through the onset of their condition, rating grids, Fransella and Bannister (1977) were developed. As comparisons both between and within subjects were sought, it was necessary to provide constructs for the rating grids, but these had to be within the range of convenience of all subjects, so were elicited from a similar population of subjects

with physical disability in the first stage and applied to the study population in Stage II.

Stage I - eliciting constructs

Subjects.

n = 58

Male 18, Female 40. Age Range 32-79

Wrist fracture 24, Stroke 34.

Attending for treatment in four physiotherapy departments.

Procedure.

During a semi-structured interview with probe questions subjects were asked to talk about ways in which they saw themselves as changed through the onset of their condition. Content analysis of interview material was undertaken to find themes or words which indicated constructs about ways in which subjects saw themselves as changed.

Results.

Content analysis of the interview material by the author and an independent worker revealed a considerable number of constructs relating to ways subjects saw themselves as changed through the onset of their condition, 10 dimensions were found by both workers to be common to all subjects. They were as follows: active, healthy, worried, frustrated, bored, control of life, independent, able to see friends/family, weak, depressed.

Stage II - development of grids

Use of rating grids.

Having selected the constructs, bipolar rating grids were developed using words describing opposite poles of the constructs. Six rating positions were given between each pole, this forcing the subject to make a decision towards one of the poles rather than seeking a neutral central position; though seven or five positions are frequently used in grids, Kelly (1955) himself suggested it might sometimes be appropriate to force subjects to make this kind of choice.

Discussion.

These constructs common to the population of subjects with physical disability would be used to examine ways in which subjects with physical disability saw themselves as changed through the onset of their condition.

Main Study.

Method.

Subjects were asked at the first interview if all the contructs on the list had personal meaning for them, i.e. were within their range of convenience. If any construct had no meaning for the subject within the context of their physical disability it would be excluded from their grid. Self was the element on each occasion when scoring each rating.

Subjects.

The main study population - see p. 14.

Materials.

The following grid items:

1.	Active	.....	Inactive
2.	Healthy	.....	Sick
3.	Able to enjoy myself	.....	Not able to enjoy myself
4.	Worried	.....	Not worried
5.	Not frustrated	.....	Frustrated
6.	Not bored	.....	Bored
7.	Able to control my life	.....	Not able to control my life
8.	Independent	.....	Dependent
9.	Strong	.....	Weak
10.	Not depressed	.....	Depressed

Procedure.

Each subject was shown a list of constructs and asked whether each one had personal meaning for them in relation to their physical disability. All those constructs which were identified by that subject as relevant were given to him/her. Each construct presented

separately on a white card 15 x 8 cm. for rating.

1. Retrospective rating.

Each subject was asked to rate each construct with self as the element 'as I was before the onset of this disability' and mark the scale accordingly.

2. Present rating.

Each subject was again asked to rate each construct with self as the element 'as I see myself now' and mark the scale accordingly.

Results.

Constructs were rated from 1-6, in each case 1 was scored for the positive desireable end of the construct, 6 the negative undesireable end. Scores from 1 to 6 represented each subject's rating on each construct. The scores were added giving a possible range from 10-60 for each subject. Raw data for each subject is given in Appendix, p. 237, 238, 243, 244.

Table 32 .

Ratings on Repertory Grids.

Stroke.	Rating 1.	Rating 2.
Mean	18.6	44.2
S.D.	8.8	11.4
Range	10-38	14-59
Wrist		
Mean	14.4	28.2
S.D.	5.3	13.0
Range	10-30	10-36

Scores:

Rating 1 = How I was before my illness.

Rating 2 = As I am now at first interview

Principal component analysis of the raw data was undertaken. Principal factoring without iteration (P.A.I. of the S.P.S.S. 1975) was used. High commonality between the variables was demonstrated see Figure 9.

Figure 9.

Commonality of construct ratings.

Variables.	Commonality.
Active/inactive	.84232
Healthy/sick	.46307
Enjoy self/no enjoy self	.61301
Not worried/worried	.38303
Not frustrated/frustrated	.77338
Not bored/bored	.56379
Able to control/not able to control	.71962
Independent/dependent	.78988
Strong/weak	.67002
Not depressed/depressed	.62951

Two factors were identified, Factor 1 having an eigen value of 6.18 and accounting for 90.7% of the variance, Factor 2 having an eigen value of .64 and accounting for 9.3% of the variance.

Factor 1 was the construct active, Factor 2 independence. Each construct had a positive and a negative pole. Higher scores related to the positive pole. Because of this and because two factors accounted for the total variance it was considerable acceptable for individual scores to be calculated by adding individual construct ratings to form a total composite score - called Rating of Self.

The relationship between the rating of self at onset was related to later recovery was examined - see Table 33.

Table 33.

Correlations between rating of self at onset with starting and attainment scores.

Stroke Group.		Starting Scores.	
Rating of self at onset	with	GBM Disability	GBM Independence
		.02	.19
		Attainment Scores.	
		-.00	-.12

Wrist Group.		Starting Scores.			
Rating of self at onset	with	Flex/Pro	UD/RD	Sup/Ext	Grip
		-.03	.06	.01	.09
		Attainment Scores.			
		-.02	.04	-.34	-.36*

* $p<.05$

Discussion.

The range of scores in both groups covered a wide range at the onset of the condition, some subjects seeing themselves as virtually unchanged by the onset of their condition, others giving extremely unfavourable ratings, seeing themselves as greatly changed.

As might be expected, the perceived changes were greater in the strokethan in the wrist group, the more widespread condition of stroke being perceived in general as causing more change, though some wrist subjects' ratings were more extreme than some stroke subjects.

The ratings were not found to be significantly related to most attainment scores as hypothesised, though all but one had a negative relationship, one in the wrist subjects reaching significance. Initial

scores showed no significant relationships with ratings at onset, again demonstrating that individual appraisal did not depend totally on objective severity.

Within the design of this thesis ratings of personal constructs did not provide prediction of outcome in terms of attained movement on discharge. Rating grids provide a useful method of exploring patients' responses to their condition, and more detailed work needs to be undertaken to examine personal constructs and recovery from physical disability.

Conclusion.

In general subjects' individual perceptions of their disability, whether appraisal of seriousness or personal constructs of perceived change, showed little relationship to objective measurements of disability. The perceptions of individual subjects of their problems and the perceptions of their therapists showed considerable variation, and there was a general lack of agreement about perceptions of individual progress.

The hypotheses proposed were not strongly supported, individual perceptions were shown to vary widely, both within and between the groups, the ranges covered being similar in both groups, but these individual perceptions were not shown to be predictors of the measures of outcome used in this thesis.

In a further study it would be useful to explore in terms of Lipowski's (1970) appraisals (see p.93), whether individuals perceived the onset of their condition and its consequences in a positive way as a challenge, an opportunity for growth and development, as a relief, a respite from life's demands, or as an enemy or punishment. For example, those who perceived their condition as substantially changing them and as serious, might be expected to respond differently if they appraised their condition as a challenge or as an irreparable

loss or damage to themselves.

The great variation between individual responses not closely related to objective measurements of physical disability supports the clinical evidence of studies such as Visotsky (1961), Hamburg et al. (1953) and Cohen and Lazarus (1980).

Individual appraisal is clearly part of the recovery process, and its relationship to outcome needs further investigation.

Chapter 2

Perceived Control

Introduction

This chapter contains discussion of concepts of perceived control as a dispositional and a situational variable. It describes available methods of measurement and examines the results of studies that have investigated the effects of controllability and uncontrollability. The relationship between perceived control and other aspects including the following, learned helplessness, depression, learning, anxiety, problem solving; health behaviour and disability,are examined. It is hypothesized that high perceived control should facilitate recovery. Since no suitable methods of measuring perceived control in the situation of recovery from physical disability were found, a recovery locus of control scale was developed, and details of its development are given. Finally, the relationship between perceived control and recovery in the main study population was examined.

.....

A number of different concepts have been investigated which share the common theme of personal control, the extent to which the individual controls his environment. Alfred Adler's concept of mastery and the inferiority complex was one of the earliest, Mowrer (1948) examined the sense of helplessness and lack of control by studying the strength of contingency between acts and effects and its importance for survival, and White (1959) investigated competance and effectance in relation to motivation. Rotter's (1954) theory was of control as a generalized expectancy across a large number of situations. Rotter et al (1962) describe the general principle as follows: 'internal control refers to the perception of positive and/or negative events as being a consequence of one's own actions and thereby under personal control, external

control refers to the perception of positive and/or negative events as being unrelated to one's own behaviour in certain situations and beyond personal control'. This construct labelled external and internal control of re-inforcement,has facilitated the exploration of the problem of contingency between act and effect. In its simplest form the basic hypothesis proposed by Rotter (1966) was that if a person perceives a reinforcement as contingent upon his own behaviour then the occurrence of either positive or negative reinforcement will strengthen or weaken potential for that behaviour to recur in the same or a similar situation. If he sees the reinforcement as being outside his own control or not contingent, depending on chance, fate, powerful others or as unpredictable, then the preceding behaviour is less likely to be strengthened or weakened.

Perceived control has been considered both as a dispositional and a situational variable. As a personality variable the original theorists saw perceived control as following a normal distribution within the population, Rotter (1975) stated there was no justification for seeing it in terms of a typology or as having a bimodal distribution.

Skill and Chance Situations.

Early experimental work on perceived locus of control as a situational variable mainly examined learning under skill and chance conditions. Numerous studies including those of Phares (1957) Blackmen (1962) Bortner (1964) Gold (1967) and Schneider (1968) demonstrated that learning under skill conditions was different from learning under chance conditions, the degree to which the individual perceived reinforcement as contingent upon his own behaviour being the most important influence.

Where tasks were described as requiring skill, implying that outcomes were controllable, subjects behaved in a more adaptive

and achieving way than when the task was described as dependent on luck. Lefcourt (1972) found that more internal control was related to the incidence of effective goal striving behaviour, apathetic withdrawal behaviour occurred when subjects perceived that other factors controlled the situation. The investigation of the effect of perceived control in situations where either skill or chance were emphasized as the controlling factors have been mainly undertaken in laboratory settings where manipulation of conditions is possible.

A dispositional variable.

Investigation of perceived control as a dispositional variable has encouraged the production of a considerable number of scales of measurement.

In a review Throop and McDonald (1971) list 13 scales of measurement. The first instrument developed by Phares in 1955 consisted of 13 skill and 13 chance items presented in a Likert-type format. Several scales have been developed specifically for use with children. Bialer's (1961) an orally administered true false scale; Crandall et al (1964) produced the Intellectual Achievement Responsibility Questionnaire which provided forced choice items pairing internal and external interpretations of achievement outcomes and Dean's (1961) assessed powerlessness and normlessness with a Likert-type scale derived from sociological studies of alienation. Dies (1968) developed a projective measure of perceived locus of control. However, the internal-external locus of control scale produced by Rotter in 1966 has been tbe most widely used in the past, and is still used extensively. The scale originally consisted of 60 items but was reduced to a 29 forced-choice scale which included six filler items. Rotter states that his test can be considered as a measure of generalized expectancy, the items dealing with beliefs about internal-external control and not about preferences, and the

scale provides a measurement of the subject's beliefs about the nature of the world. The scale is a broad gauge instrument and does not allow very high prediction in specific situations, and therefore individual prediction for practical purposes using this scale is not warranted.

The aim of the Rotter E/I scale was to predict across a large number of situations, and Phares (1972) suggested that if prediction of behaviour in one situation or a homogenous class of situations was desired then it would be advantageous to develop a scale of items essentially directed to that situation. Rotter (1975) also supports this, particularly if one is seeking some practical application where every increment in prediction is important. A narrow or more specific expectancy should allow greater prediction for a situation of the same sub class but poorer for other kinds of less similar situations.

Situation specific measures have been developed in the field of health and illness. Wallston et al (1976) produced the health locus of control (HLC) scale as 'an area specific measure of expectancies regarding locus of control for prediction of health related behaviour'. The scale consists of 11 items, five internal and six external which are presented using a 6-point Likert-type format, the subject being asked to express the extent of their agreement or disagreement with each item on a 6-point scale from strongly agree to strongly disagree. The items are broadly related to health and illness, for example (1) if I take care of myself I can avoid illness and (3) good health is largely a matter of good fortune. The scale does not relate to specific aspects of health, illness or disability, rather it is a broad general measure about beliefs related to health behaviour.

Before discussing experimental work in this area it is worth noting the problem of interpreting the results of some of the studies

where the researchers have made assumptions about the distribution of perceived locus of control as a dispositional variable, not made by the original theorists. Studies such as those of Hersch and Scheibe (1967), Julian and Katz (1967) and Biondo and MacDonald (1970) described their study populations in terms of 'internals' and externals'. This bimodal distribution was not conceptualized by early theorists Rotter (1975) and Phares (1976). Lefcourt (1982) emphasises that the terms 'internal' and 'external' are expressions referring to casual expectations. Referents of the construct of locus of control not the construct itself - 'rough approximations of what is believed to be a person's expectancies about control'.

The relationship between perceived control and other factors is examined in a number of situations that have relevance for the study of recovery from physical disability.

Learned Helplessness.

Learned helplessness was defined by Seligman (1975) as 'a psychological state that results when events are uncontrollable'. The repeated experience of uncontrollability in a situation is said to lead to the expectation of uncontrollability in similar situations in the future and thereby affect responding in these situations. The majority of the early work on learned helplessness involved work with animals. A classical experiment (Seligman 1975) consisted of dogs being strapped into a hammock and given moderately painful inescapable electrical shocks; no voluntary response by the animal altered or diminished the shock. Subsequently these dogs were placed in a shuttle box, in one chamber the animal received a shock but could escape by leaping a barrier. Naive animals who have not been subjected to inescapable shock tried to escape and quickly learned to avoid the shock by leaping the barrier. The animals who had received the inescapable shock at

first ran round like the naive dogs but soon appeared to give up and lie down, passively accepting the shocks. They appeared to have learned independence of response contingency - that results that occurred were unrelated to their behaviour.

Experiments made with human subjects have often used aversive noise as the unpleasant uncontrollable stimulus. Hiroto (1974) subjected psychology students to aversive noise under conditions of uncontrollability, these students responded differently in subsequent situations involving aversive noise, from those students who had not had previous experience of uncontrollability, the former reacted passively and seemed to have learned helplessness in a similar way to animals with experience of uncontrollability.

In order to establish that the helpless behaviour is a result of uncontrollability and not the result of receiving physical trauma, Seligman and Beagley (1975) introduced a triadic design. Using three groups of subjects, the first received pre-treatment where control of an aversive outcome was possible - the second were yoked to the first group and so received the same aversive outcomes but had no control, the third group received no pre-treatment. Twenty-four hours after this pre-treatment the three groups received escape avoidance training in the shuttlebox. The first and third group quickly learned to escape but the yoked group failed to do so and remained passively accepting the shocks, indicating that previous uncontrollability was the key factor in producing passivity.

The conclusion from these studies is that experience of uncontrollability produces deterioration in the readiness of animals and man to respond adaptively to trauma Seligman, (1975). Seligman found that uncontrollable reward as well as uncontrollable aversive stimuli can effect future responding. Rats who received food without responding, were later much slower to learn instrumental responses to obtain food, the more food they received in pre-training without

responding the more later learning was disrupted.

Glass and Singer (1972) found that not only actual control but a belief in control reduced the deficit produced by uncontrollability. Belief in controllability but actual uncontrollability, and actual controllability can produce the same expectations, and it is the expectations that are important in determining the acquisition of learned helplessness.

Hiroto (1974) suggests close links between locus of control and learned helplessness. Externality, that is believing that events are controlled by chance, fate or powerful others rather than being under personal control can be related to the state of learned helplessness, uncontrollability and a belief in a lack of personal control being similar. A negative cognitive set can be produced by both externality and learned helplessness because of perceived independence between responding and outcome.

Miller and Seligman (1975) demonstrated the effect of negative cognitive set produced by uncontrollability, their subjects were divided into three pre-treatment groups, of escapable noise, inescapable noise and no noise. All groups were then given skill and chance tasks. expectancy changes were reported following success or failure in the groups who had escapable noise or no noise pre-treatment, but the group who had experienced inescapable noise did not report any changes in expectancy. Hiroto (1974) working with students who were divided on the basis of internality and externality of their scores on a locus of control scale, found that three independent factors produced helplessness in his subjects, the laboratory experience of uncontrollability, cognitive set induced by chance instructions,and more external personality.

Depression.

Heightened emotional arousal occurred in studies of learned helplessness when the traumatic aversive event first occurred, this Seligman (1975) described as fear, it decreased with time and if uncontrollable aversive events continued he maintained that depression resulted.

Seligman (1975) suggested that depression is a widely used diagnostic label which covers a family of symptoms, no single factor identifying all types of depression. However, listing the six symptoms of learned helplessness he drew parallels to each in clinical models of depression. These common symptoms were lowered initiation of voluntary responses, negative cognitive set, the time course where the effect of a single episode of uncontrollability dissipates with time, lowered aggression, and a loss of appetite for food, sex and social intercourse. Physiological correlates were also included, it has been found experimentally that there is norepinephrine depletion in helpless rats, and helpless cats were found to be cholinergically over-active Seligman (1975).

In line with the behaviourist approach to depression, Melges and Bowlby (1969) saw helplessness as the core condition of depression with a loss of reinforcement causing extinction of responding.

The original theoretical position of learned helplessness as a core condition leading to depression, and the experimental work supporting it have been much criticized. Interpretations of data from experimental work by Seligman et al. (1968), Miller and Seligman (1973), Maier and Seligman (1976) and others has been challenged. In a critical review Costello (1978) contends that because of methodological and conceptual problems in the experimental work he could find little or no support for the learned helplessness theory of depression.

In response to these criticisms Abramson et al (1978) put forward a reformulation of the hypothesis of learned helplessness in humans based on a revision of attribution theory. They proposed that when people perceive that events are not contingent upon their behaviour they attribute their helplessness to a cause. This cause can be stable or unstable, global or specific, and internal or external. The attribution made, influences expectation of future helplessness which may be chronic or acute, broad or narrow; helplessness may or may not lower self-esteem.

The reformulated learned helplessness hypothesis provides a unified theoretical framework integrating animal and human data. Learning that outcomes are uncontrollable results in three deficits, cognitive, motivational and emotional. Cognitive because an exposure to uncontrollability itself is not sufficient to render an organism helpless; the organism must come to expect that outcomes are uncontrollable in order to exhibit helplessness. The motivational deficit consists of retarded initiation of voluntary responses resulting from the expectation that outcomes are uncontrollable, and the depressed affect is a consequence of learning that outcomes are uncontrollable.

Learning.

Learning response outcome independence is the central issue in developing a belief in uncontrollability. When a response is explicitly rewarded or punished it is clear that the outcome is dependent on the response, when the outcome occurs regardless of the responses of the individual, whether the outcome is reward or punishment, the organism learns that outcomes are not dependent on his responding and will carry this learning into subsequent situations.

The cognitive disturbance brought about by the experience of uncontrollability is particularly disruptive in that having learnt

response outcome independence, if a response does produce a favourable outcome perception of the response-reward link is lacking. Response outcome independence having been learnt actively interferes with learning that contradicts it.

In experimental situations previous experience of uncontrollability interferes with problem solving and learning to escape physical trauma. Organisms without prior experience of uncontrollability soon learnt to escape from aversive experiences where escape was possible. Learning helplessness appeared to have interfered with learning to escape.

Anxiety

Hypotheses about the relationship between perceived locus of control and anxiety have been tested in a number of studies. Butterfield (1964) reported a significant relationship between locus of control and scores on the Alpert Haber achievement anxiety test (AAT), Watson (1967) examined the relationship between manifest anxiety (MA) Taylor's Manifest Anxiety (1953) and the AAT and found significant relationships between the MA, Locus of Control and AAT subscales. These studies and those of Mandler and Watson (1966) and Ray and Katahn (1968) all support the proposition that anxiety scales and the locus of control scale are measuring conceptually different variables which correlate with each other, and that this correlation is not due to a hidden factor within the locus of control instrument.

Actual or appraised lack of control, higher externality, has been shown to be related to higher levels of anxiety in a number of situations Ray and Katahn (1968) Mandler and Watson (1966). These authors found that if an organism has some control over a potentially stressful situation, or expects to have such control, there is likely to be

less reported anxiety. Efran (1963) Lipp et al (1968) and Phares (1968) explain these differences on the basis that repression or forgetting of failures and unpleasant experiences has been found to be associated with higher internality, therefore more internal subjects might be expected to report less anxiety and fewer symptoms, this in turn accounting for the suggested positive relationship between internality and adjustment.

Both Bowers (1968) and Watson and Baumel (1967) propose that perceptions of no control interact with personality factors, they suggest an incongruence hypothesis, that the perception of control in a particular situation may differentially increase the anxiety of subjects who typically view significant re-inforcers as being outside their personal control. The more internal individual's tendency towards action-oriented solutions may result in greater success and ultimately less anxiety, Phares (1968).

Threat.

In threatening situations different responses have been found, when presented with the opportunity to take overt remedial action, more internal subjects showed a greater tendency to take the opportunity than did more external subjects. Phares et al (1968). These authors also found that external subjects reacted with less anxiety than internal subjects when threatening material challenging the subjects view of himself was presented. Phares (1962) in a situation where stimuli were presented to a skill and chance group, accompanied by shock, reported that subjects who perceived control over the situation exhibited perceptual behaviour that enabled them to cope more effectively with the potential threat of the shock than those who perceived no such control.

Problemsolving

A number of studies report that those with higher internal beliefs respond differently in problem solving situations than those with more external beliefs. Phares (1968) found more internally oriented subjects exhibited a greater willingness to engage in action taking behaviours and utilize the available information. Other studies have also reported a pattern where greater internality is associated with more direct confrontation with problems. Gore and Rotter (1963) Davis and Phares (1968).

Resistance to influence

There are suggestions in the literature that response to covert influence varies with internal and external orientation. Gore (1962) and Strickland (1962) both found subjects who were more internal were more resistant to covert influence. Where influence is overt Ritchie and Phares (1969) found no differences. McDonald and Hall (1971) found more external subjects more sensitive to covert influence particularly from those in higher status positions. Julian and Katz (1966) found that under some circumstances where the organization of rewards was contingent upon relinquishing control, control was more important than the reward and higher internal subjects were prepared to 'cut off their nose to spite their face'.

Health

In a review of the literature on health and perceived locus of control, Wallston and Wallston (1978) conclude that there is evidence that greater internality - believing that re-inforcement is contingent on behaviour, is associated with the likelihood of engaging in

behaviours that facilitate wellbeing. In the field of preventive health care James et al.(1965) found non smokers more likely to be more internal, smokers more external, and a significant relationship was reported between subjects who had stopped smoking, and higher internality. Steffy et al (1970) also found that non-smokers and those who had reduced smoking were higher on internality. Other studies have not supported this finding Best and Steffy (1971) Lichtenstein (1967). A reason for these differences is proposed in later studies by Best (1975) and Best and Steffy (1975),that giving up or reducing smoking by more internal individuals may only occur under certain conditions with an interaction between type of treatment and perceived control. This interaction is also supported in weight loss programmes. Balch and Ross (1975) found that those deemed external on the Health Locus of Control Scale (HLC) lost more weight on an externally orientated programme,while those deemed internal only lost weight on an internally orientated self directed programme. Williams (1972) also found greater internality related to two other aspects of preventive health care, subjects who held more internal beliefs made greater use of seat belts in cars before this was obligatory by law, and also undertook more preventive dental care.

Working with patients with diagnosed illness, Seeman and Evans (1962) reported that more internal tuberculosis patients knew more about their condition and actively sought more information about it than more external patients. Ducette (1974) also found the same differences in newly diagnosed diabetics - more internal patients had more knowledge about their condition than more external patients. This however was not the case for longer term diabetics, the authors suggest this may reflect the longer term unpredictable course of this condition which may have, over time, effected perceptions of control. It appears that perceptions of internal and external control may be

predictors of different types of health related behaviours, in particular seeking information, taking medication, making and keeping appointments, maintaining diets and giving up smoking.

Pain.

Bowers (1968) reported that perception of control over a painful stimulus led to greater tolerance of that pain and less reported pain and anxiety. This has been replicated in a number of laboratory studies but in real life situations the results are less clear cut. Scott Palmer and Skevington.(1981) found a correlation between perceived lack of control and less pain, women in labour who perceived less personal control over their environment reported less pain than those perceiving more personal control,who reported more pain. A similar result was obtained by Johnson et al (1971) in a group of women under-going abdominal surgery, those who perceived more control reported more pain and requested more analgesics than women who perceived less control. Brewin and Bradley (1982) suggest that personal control in labour could be interpreted in different ways, control could be either by prophylaxis or by directing staff in the management of their labour; in their study a positive relationship was found between ratings of perceived staff control over discomfort and reported discomfort. More reported discomfort here being related to more external control.

Disability.

Though there have been few rigorous studies investigating physical disability and perceived control there are suggestions in the literature that there may be a relationship. Finlayson and Rourke (1978) reported finding a relationship between higher internality as measured by the Nowicki Strickland test and motivation in treatment, this in turn related to outcome of treatment. In patients with

hemiplegia the weakness of this study was that motivation and outome of treatment were not clearly defined and were based on therapists' subjective judgements. Lipp et al (1968) examined the perceptions of subjects viewing disabled people. Those who were more externally orientated were less denying of disability than were more internally orientated subjects. They suggest that disability is more threatening for subjects orientated to internal control. McDonald and Hall (1981) also found differences related to internality and types of disability. Subjects who were more external on Rotter's (1966) scale rated physical disability as more debilitating than emotional disorders, whereas those who were more internally orientated rated emotional disorders as relatively more debilitating than physical disability - control may seem to be lost to a greater extent in emotional disorders and therefore be a more threatening situation than one of physical disability for more internally orientated subjects.

Recovery from physical disability : Hypotheses.

The work investigating the effects of perceived control on behaviour in many situations suggests that subjects who perceive more control over their own recovery will differ in their behaviour during the process of that recovery from subjects who perceive less control.

Because a belief in internal control has been shown to be associated with more active problem solving, a readiness to confront problems, and the under taking of health related behaviours it was hypothesized that subjects who affirmed that they had more personal control over their recovery would:

1) achieve higher levels of independent performance of self care

activities

2) attain more during the process of recovery given their initial level of disability, and would do this in less time than those who perceived less personal control.

For wrist group subjects only, for whom pain was one of the clinical indices it was hypothesized that

3) higher levels of pain reported would be associated with reporting less perceived personal control, and that

4) reporting of less restriction of activity would be associated with greater perceived personal control.

Development of a locus of control for recovery scale.

Because a situation specific measure was required to assess the extent to which subjects perceived that they themselves had personal control over their own recovery, widely used scales such as Rotter's (1966) E/I scale which are broad general measures were not suitable. The health locus of control scale Wallston (1976) was also rejected as it related to broad concepts of health particularly in the field of prevention. Bearing in mind Phares' (1976) statement that it would be advantageous to develop a scale of items essentially directed to a particular situation if prediction within that situation was required, a 9-item scale of locus of control for recovery was developed. Items were selected from patients' statements made during informal tape-recorded interviews.

Method.

Statements elicited from patients during the recovery phase of stroke and a wrist fracture were presented to independent judges who rated them as either internal or external.

Subjects.

10 judges, 6 female, 4 male included clinical and non-clinical

psychologists, other graduates working in health care research and physiotherapists. Age range 24-50.

Materials.

Fourteen statements listed in table 34 on p. 142.

Procedure.

The fourteen statements were given to the judges with the following instructions:

> "There seems to be a difference in the beliefs that people hold about the control that they themselves have over the outcome of a particular situation. Patients who had conditions involving different kinds of physical disability used the following sentences when describing how they perceived control over their own recovery.
>
> Some indicated they perceived that they had control, Others that there was a lack of personal control, i.e. that their recovery would be controlled by chance, luck or powerful others. Could you please indicate with an I sentences which imply a belief in personal control over recovery, and E to sentences which imply a belief that luck, chance or powerful others will be more influential. Leave blank any statements which do not seem to indicate either E = external control or I = internal control."

Results.

The results of the allocations by the judges are given in Table 34.

Table 34.

Statements given to judges for allocation as internal or external.

		No. of judges rating item as E	I	Final Allocation.
1.	I have little or no control over my progress from now on.	10		E
2.	It doesn't matter how much help you get, in the end it's your own efforts that count.		10	I
3.	I'm relying on the staff here to get me better.	9		
4.	It's what I do to help myself that's really going to make all the difference.		10	I
5.	My own efforts are not very important, my recovery really depends on others.	10		E
6.	Recovery is really a matter of luck.	10		
7.	How I manage in the future depends on me, not on what other people can do for me.		10	I
8.	The treatment you receive is the most important thing in recovery.	9		
9.	How you manage depends on you yourself and no one else.		10	
10.	It's up to me to make sure I make the best recovery possible under the circumstances.		10	I
11.	My own contribution to my recovery doesn't amount to much.	10		E
12.	It's often best to just wait and see what happens.	10		E
13.	How you get on depends on your own efforts.		10	
14.	Getting better now is a matter of my own determination rather than anything else.		10	I

Discussion and conclusion

There was complete agreement between the judges on the assignment of 12 items as representing either internal or external control over recovery, and from these 12, nine were selected to form the L.O.C. Recovery Scale. Numbers 2, 4, 7, 10 and 14 representing a belief in internal control, numbers 1, 5, 11 and 12 representing a lack of belief in internal control, or belief in external control

Investigation of perceived control in recovery from physical disability.

The recovery locus of control scale was used to examine beliefs about personal control over recovery and the results were also used to test the validity of the scale.

Methods

The main study population of subjects with stroke and a wrist fracture were tested during their recovery to find out the extent of their belief in personal control over recovery.

The recovery locus of control scale was completed by each subject during the week following their entrance into the study. The results obtained from the study population were examined to find the extent of the validity and reliability of R.L.O.C. scale when used with these subjects.

Subjects

The main study population see p. 14.

Materials.

Recovery locus of control scale.

	Strongly agree	Agree	Uncertain	Disagree	Strongly disagree
How I manage in the future depends on me, not on what other people can do for me.					
It's often best to just wait and see what happens.					
It's what I do to help myself that's really going to make all the difference.					
My own efforts are not very important, my recovery really depends on others.					
It's up to me to make sure I make the best recovery possible under the circumstances.					
My own contribution to my recovery doesn't amount to much.					
Getting better now is a matter of my own determination rather than anything else.					
I have little or no control over my progress from now on.					
It doesn't matter how much help you get, in the end it's your own efforts that count.					

Procedure.

Each subject was given the above form with the following verbatim instructions:

'These are statements other patients have made about their recovery. Will you indicate the extent to which you agree or disagree with them in the right hand columns.'

Results.

Items were scored as follows in the 5 point Likert-type

rating scale:

	Strongly Agree.	Agree	Uncertain	Disagree	Strongly Disagree.
Internal items	5	4	3	2	1
External items	1	2	3	4	5

As the scale was scored in the direction of internality higher scores indicated a greater belief in personal control.

The total possible score was 45 and the scores of the 40 patients ranged from 23-43 with a mean of 31.9.

	Mean.	Range.	S.D.
Stroke group	33.0	23-43	6.1
Wrist group	30.8	23-38	5.6

Content Validity.

The appropriateness of the items was evidenced by the fact that the items were statements made by patients about their control over their own recovery and agreed by judges to be representing either internal or external control. The statements were similar to items in other scales of perceived control, and all referred to expectations about perceived control over recovery.

Face Validity.

Appeared to be high for patients who undertook to complete the scale.

Internal consistency.

The internal consistency of the E and I items of the scale is demonstrated by the results in Table 35 with a significant positive relationship between similar items, and a significant negative one between dissimilar items.

Table 35

Locus of control scores.

Correlations between Internal items and Internal mean.		Correlations between External items and External mean.	
Items.		Items.	
1	.54***	2	.64***
3	.75***	4	.49***
5	.72***	6	.79***
7	.56***	8	.80***
9	.49***		

Correlation between internal mean and external mean -.79***

*** $p < .001$.

Construct Validity.

The purpose of the scale was to examine the extent of the subject's belief in their own personal control over their recovery. Subjects who agreed strongly with I items, indicating belief in personal control, disagreed with E items, which indicated belief in external control; the items differentiating between belief in E and I control. The relationships between perceived control, as measured by the R.L.O.C. Scale, and other recovery variables was examined and results are given in Table 36.

Table 36.

Perceived Control and recovery Variables.

Stroke Group.	Attainment Scores.		Personal Care Scores.	
R.L.O.C. Scores with	GBM Ind.	-.02	Assessment I	.36
	GBM Dis.	.39*	Assessment II	.39*
Total weeks treatment	-.13			
Wrist Group.				
R.L.O.C. Scores with	Flex/Pro	.48*	Assessment I	.15
	UD/RD	.17	Assessment II	.35
	Sup/Ext	.54**		
	Grip	.38*		

Pain Scores.		Activity Restriction.	
Assessment I	.22	Assessment I	-.38*
Assessment II	.19	Assessment II	-.39*
Total weeks treatment	-.45**		

Discussion.

Overall there was some support for the hypotheses suggesting that extent of perceived personal control would be related to some recovery variables.

The extent of independent performance of personal care was positively related to a greater belief in personal control over recovery, significantly so in the stroke group, just failing to reach significance for wrist group subjects. This result would seem to be in line with the work of Gore and Rotter (1963) and Davis and Phares (1968) in which greater internality was associated with more direct confrontation with problems and with problem solving behaviour. Also possibly showing similar results to the work of Poll

and De-Nour (1980) who found that patients on chronic haemodialysis with higher perceived internal control ,adjusted and adapted to physical disability better than those who had a stronger belief in external control.

The second hypothesis that there would be a relationship between perceived personal control and attainment was also partially supported in both groups. This again suggesting that believing that there is more personal control over recovery from physical disability is associated with higher attainment of performance, that is subjects who profess a stronger belief in personal control attain more than might have been expected, given their initial level of disability. The relationship between time of recovery and perceived control was different for the two groups, with no relationships found in the stroke group of subjects, however, for the wrist group subjects there was a significant negative relationship between time on treatment and perceived control, those who believed they had more control having a shorter time on treatment. The lack of relationship in the stroke group may have reflected the differing nature of the condition and the fact that all stroke subjects were in-patients in hospital, and discharge may have depended on social and environmental, as well as health or disability factors. Wrist subjects only needed to keep attending while they felt they needed to, those believing more in their own control of recovery probably perceiving less need for continued treatment.

It was expected that perceivedcontrol would be related negatively to reports of pain, but no significant relationships were found either positive or negative. Both Scott, Palmer and Skevington (1981) and Brewin and Bradley (1982) suggest that in real-life situations the relationship between pain and control is complex, with control being interpreted in different ways. Another confusing factor here may be that the subjects reporting higher internality also reported less

activity restriction, if they were more active, they may in fact have had more localised cause for pain.

The significant negative relationships found between reported restriction of activity and perceived control supported the hypothesis proposed, and again demonstrated that belief in more personal control was associated with better adjustment and less disability.

The results of this section of the thesis provide some support for the hypothesis that perceived personal control is associated with the type and extent of recovery from physical disability, and it may be a factor which could improve prediction of some aspects of recovery from physical disability.

Chapter 3

Coping

Introduction

This chapter examines ways in which coping has been conceptualized, including both dispositional aspects and the strategies actually used. Methods of assessment and measurement are considered in relation to the conceptual approaches. Methods used to investigate coping in subjects with physical disability are outlined and hypotheses formulated about ways of coping with physical disability. Results of analysis of interview sessions are given, illustrated by examples from the data.

While recognising the importance of coping in recovery from physical disability no attempt was made in this thesis to relate ways of coping to outcome because of methodological problems.

.....

Coping is a central factor in the process of recovery, influenced by individual perceptions and attributions and conceptualized in different ways; it is essentially concerned with individual responses and behaviours following a stressful event. Pearlin and Schooler (1978) define coping as the things people do to avoid being harmed by life's strains, 'any response to external life strains that serves to prevent, avoid or control emotional distress'. Within this framework coping is inseparable from life's strains and inner emotional life. Lipowski's (1970) approach stresses the strategies used for dealing with the threat of illness, and coping is defined as a form

of illness behaviour, the determinants being intrapersonal, disease related and environmental variables. The actual coping behaviour being "all cognitive and motor activities which a sick person employs to preserve his bodily and psychic integrity, to recover reversibly impaired function and compensate to the limit for irreversible impairment".

Ray et al. (1982) also conceptualize coping behaviourally but stress both reactive and strategic aspects. Within their model the onset of illness disturbs an individual's equilibrium and if he does not yield hopelessly to his altered circumstances but responds to regain and maintain a degree of equilibrium, then all forms of behaviour which offer resistance to the difficult situation can be termed coping.

Stress is frequently mentioned in the literature on coping, McGrath (1970) conceptualizing coping as a response to stress, where stress is defined in terms of objective situational factors independent of the individual. A second relationship between stress and coping is that stress may be a possible outcome of coping, coping that has failed for the individual; coping can be seen both as a response factor in relation to stress and a causal factor in relation to strain. Stress in relation to coping which can be conceptualized in interactional terms, stress being a function of situational demands in relation to the resources the individual has available to meet the situation. The key concept here is the imbalance between the problem and the deficit in the individual's capacity to assimilate or accomodate to it. Imbalance reflects coping inadequacy but because a state of disequilibrium exists this may in turn give rise to a reorganisation and development of structures and processes which foster coping. Ray et al. (1982) stress the

importance of separating goals and modes of coping from the end result actually achieved.

The aim of coping is to bring about change. Ray et al. (1982) suggest that the dimension to be changed may be the anticipated effects, the subjective representation of these effects and the emotional response to them. Lazarus and Launier (1978) and Folkman and Lazarus (1980) suggest the problem solving focus in coping is either directed towards the problems arising from the condition or emotional reactions to it, which may also present problems for the individual.

In the literature on coping a distinction has been made between coping styles and coping strategies. Coping style referring to the individuals's enduring disposition to deal with challenges and stresses with a specific constellation of techniques, Lipowski, (1970). Coping strategies are the responses and behaviours actually employed by the individual to deal with the illness and its consequences. Some strategies are surface behaviour, direct overt action, others are intrapsychic and by definition covert, Lazarus, (1974). Both aspects have been investigated in relation to illness.

Coping style

Individual coping style in illness has been investigated within a number of different frameworks which share the broad conceptual approach/avoidance focus; some individuals responding with a tendency towards the event and focusing upon it, others demonstrating a tendency to avoidance. Lipowski (1970) discusses these concepts in relation to illness as vigilant focusing and minimisation. A vigilant focusing style implies a brisk response to perceived

danger and persistent attempts to reduce uncertainty and ambiguity about all aspects of illness. Minimisation on the other hand is characterized by a tendency to ignore, deny or rationalize personal significance of information related to the illness and its consequences. Minimisation can range from total denial to reasonable doubt. Clinical studies indicate that denial of illness or its significance is common in the early phases of sudden severe illness Visotsky et al., (1961) and in the case of acute illness denial may be an adaptive emergency mechanism Hamburg et al., (1953). Vigilant focusing implies a desire to know what is happening, the meaning and results of diagnostic and therapeutic procedures, seeking all relevant information and making sense of the experience. Again a continuum is possible from hypervigilance to a realistic recognition of threats and tasks, and rational planning.

Lipowski (1970) also discusses three habitual modes or styles of coping demonstrated by those who are sick; tackling, a disposition to adapt an active attitude towards challenges and tasks imposed by illness and disability; capitulating, a mode characterized by passivity and either withdrawal or dependence on others; and avoiding, a style characterised by active efforts to get away from the illness, attempted flight into health. Byrne (1964) examines conceptually similar styles as sensitisation and repression. Cohen and Lazarus (1973) examining coping dispositions and recovery from surgery divided their subjects on the basis of demonstrating avoidance, vigilance, or both kinds of behaviour, and in their study the vigilant group had the most complicated post-operative recovery, as measured by days in hospital and minor complications. Other studies suggest that it is the avoidant patient who shows the poorest course

of recovery, as this style prevents working through threat Janis, (1958) Goldstein, (1965).

In their examination of post-operative behaviour and coping styles however Cohen and Lazarus (1973) failed to find any effect of avoidance-coping or repression sensitization. Hoffman (1970) recognizing the problems of interpreting the literature on coping styles found only weak and non-significant associations between coping dispositions and actual coping behaviour, or coping strategies.

The conceptualisation of coping as a personality trait overlaps with the previous ego process approach to coping. Methods here include Byrne's (1964) repression-sensitization scale, Goldstein's (1959) coping-avoidance sentence completion test, and Gleser and Ihilevich's (1969) defense mechanisms inventory. Lazarus (1974) points out that traits differ from defensive processes in that they refer not to a defensive response per se but to dispositional or personality attributes that lead to the response.

In general trait measures are based on the assumption that people are behaviourally consistent across situations. But even use of person by situation interactions does not greatly improve the extent to which traits predict behaviour Bowers, (1973) Pervin and Lewis, (1978) and overall trait measures are poor predictors of the coping process Cohen and Lazarus, (1973) Lazarus (1974).

The undimensional quality of most trait measures does not adequately reflect the multidimensional quality of the actual coping process. Early naturalist observations of coping in different situations such as studies by Vitotsky et al. (1961) and Mechanic (1962b) indicate that coping is a complex amalgam of thoughts and behaviour. Moos and Tsu (1977) in discussing coping with physical

illness describe how the patient has to deal with different sources of stress, pain, incapacitation, hospital environment and the demands of treatment procedures and hospital staff. At the same time they must strive to preserve emotional balance, satisfactory self image, and good relationship with family and friends. These multiple tasks may require a variety of different coping strategies and an undimensional trait measure cannot deal with the inherent complexity.

Coping strategies

Coping strategies - the actual behaviour of individuals does not make any assumptions about trait characteristics. Pless and Pinkerton (1975) have conceptualized the coping strategies used following the appraisal of the threat of illness as 'all techniques employed by the individual to deal with the illness and its consequences'. Many authors stress the individual nature of response to illness and the different strategies used by those with similar medical conditions Lipowski, (1970) Lazarus&Launier, (1978) Moos, (1977). Not only is individual variation stressed,but the fact that strategies are not inherently adaptive or maladaptive,and what is appropriate and adaptive at one stage of an illness may not be so at another stage. The problem-solving nature of strategies used to cope with physical illness is seen by Lipowski (1970) as all cognitive and motor activities which a sick person employs to preserve his bodily and psychic integrity to recover reversibly impaired function and compensate to the limit for an irreversible impairment, this again stresses the positive nature of the aim of coping.

Each individual's response to illness will reflect the personal meaning of the illness for him, among those listed by Lipowski

(1970) are illness as a challenge, and as an enemy. Common coping strategies found in medical settings listed by various authors include reversal of affect, confrontation, tension reduction, disowning responsibility, compliance and self-pity Weisman and Worden, (1976-77). Others list seeking information, requesting reassurance, setting concrete limited goals, and finding a general purpose or pattern of meaning in events Moos and Tsu, (1977).

Among the other approaches which are not covered in the three previous categories is that of Pearlin and Schooler (1978) which is concerned with the ordinary stresses people encounter. Four social roles are stressed in this model, the marriage partner, household economic manager, parent and worker. A broad range of strategies are associated with the roles and 17 coping factors are identified. Some of these appear in all four role areas but others in one area only, this implies both consistency and variability in coping, this approach is supported in studies by Moos (1974b) and Sidle et al. (1969).

However there are two limitations to this approach. Most analyses are based on questions asking the respondents how they usually coped with general sources of stress, not how they actually coped in specific situations. General abstract characteristics of situations do not provide information about specific demands with which the person is coping. When asked to describe how he or she 'usually' copes information is being solicited about a dispositional factor and poses the same problems as other trait measurement.

Another problem with this approach is that there is not necessarily a close relationship between what people say they usually do and what they actually do in specific situations. The second

limitation of Pearlin and Schooler's (1978) method is that subjects were not asked about stresses they had resolved or were successful in overcoming; also information about the extent to which coping responses were effective in changing the situation out of which the stress arose is not available.

Coping in terms of ego-processes.

In this approach Haan (1977) omits surface behaviour; the base is ten generic processes representing four kinds of function, cognitive reflective, intraceptive, attention-focusing, and regulation of affects and impulses. There are three modes in which each process may be expressed, coping which is reality oriented, defence which represents a distortion of reality, and fragmentation, a blatant disregard for reality. The placement of ego processes on an evaluative dimension if often make on the basis of how well the person functions, this represents a major difficulty as the process of coping is confounded with the adaptational outcome.

In Wolff et al.'s (1964) study of 'well-defended' parents of terminally ill children, the measure of well-defendedness was partly based on the evidence of lack of distress. The parents' degree of 'defence' was used to predict stress hormone levels, and in these circumstances it was found that the stress level of corticosteroid secretion was negatively correlated with level of 'well-defendedness'. Vaillant's (1976) study also confounds process and outcome. Behaviour at times of crisis in each man's life is described and the behaviours assigned a defence rate according to relative maturity, raters being given a 'life style summary' to assist in rating behaviour. Defence being rated in terms of man's overall functioning. The level

of 'maturity' of defence was subsequently used to distinguish outcome groups, however interdependence between process and adaptational out-come invalidates the use of process to explain outcome.

Maintaining emotional equilibrium is clearly an important function of coping Cohen and Lazarus, (1980) White, (1974) but problem solving is equally so Janis and Mann, (1979) Mechanic, (1962b) and Murphy, (1974). The methods of measurement of ego processes can be criticized for the way in which process and outcome are interdependent and because they do not encompass both problem solving and emotional equilibrium.

Situation specific coping

This approach, because it is not limited to defense or trait relevant processes, allows a more comprehensive description of coping. A number of studies have examined coping in patients with specific conditions, cancer patients Weisman and Worden, (1976-77), polio patients Visotsky et al., (1961), patient with burns Andreasen and Norris, (1972), and spinal cord injury patients Bulman and Wortman, (1977). In these studies coping strategies are grouped into functional categories, such as maintaining or restoring interpersonal relationships, seeking information, feeling better, maintaining self esteem, making good impressions.

Although the strategies described include defense they are not organized around defense theory, rather they are described in terms of the function they serve in a particular situation. The problem with this approach is that identifying coping strategies that result in adaptational outcomes in unusual situations is not generaliseable and the results of most situation oriented coping research is situation specific.

Methods of assessment and measurement of coping.

There is general concern in the literature about the lack of appropriate methods for assessing coping; Folkman and Lazarus (1980) comment that 'measures devised are inadequate or inappropriate to deal with the way ordinary people deal with stressful events in their lives'. Ray et al. (1982) suggest that the ideal scheme for examining coping would be specific to any particular situation but generaliseable across a number of contexts, it would also be comprehensive, encompassing not only varied goals but also modes of coping. The authors failed to find any of the schemata available which met these criteria.

Necessary prerequisites for developing an approach to the measurement of coping suggested by Folkman and Lazarus (1980) are some understanding of coping across stressors and of the determinants of coping, intra-individual analysis to date seems to show that people are more variable than consistent in their coping patterns. Approaches to the measurement of coping have been based on three broad perspectives: first coping in terms of ego-processes Haan, (1977); Vaillant, (1976); second, coping as traits Lazarus, (1974); and third coping in terms of special demands of specific situations Moos, (1977) Parkes, (1972).

Recognizing the deficiencies in other approaches to measuring the coping process Folkman and Lazarus (1980) develped a Ways of Coping Checklist which consisted of 68 items describing a broad range of behavioural and cognitive coping strategies an individual might use in a stressful situation. The checklist is scored as either yes or no and answered with a specific stressful event in mind. Items are either problem focused or emotion focused. Problem focused items describe cognitive problem solving efforts and behavioural

strategies for altering or managing the situation; emotion focused items describe cognitive and behavioural efforts directed at reducing or managing emotional distress. The authors demonstrate the internal consistency of the items and support for the P-scale and E-scale Folkman and Lazarus, (1980, p. 255). These authors quote the results of the study where both problem focused and emotion focused coping were used by their subjects in virtually every stressful encounter as demonstrating the multidimensional nature of the coping process.

Ray et al. (1982) have developed coping themes as a means of investigating the coping process, the focus is on the individual's general orientation or disposition towards the situation, this defined by both appraisals and other forms of coping. Six themes are included and ordered according to two dimensions, their defensiveness and the degree of attemtpted personal control/helplessness that they imply. Each theme has a weaker and a stronger version and may be associated with one or more defense mechanisms, particularly compatible with that theme. The six themes are as follows: rejection, control, resignation, minimisation, avoidance, dependency. The authors describe characteristics of these themes in breast cancer and surgical patients. The style of the themes is given by the individual's appraisal of his position in relation to the situation and the forms of behaviour which reflect this orientation.

Coping during recovery from physical disability.

The multifaceted nature of coping in response to illness has been demonstrated in both descriptive and investigative studies. The onset of physical disability would in general be accepted as a potentially stressful situation disturbing an individual's personal

equilibrium necessitating responses to regain and maintain a degree of equilibrium.

The necessary antecedents of coping behaviour, the primary appraisal of the situation by the individual of the threat posed and secondary appraisal of both the threat and the individual resources available to meet it have been discussed in Chapter 1 Because of the emphasis here on situational rather than dispositional aspects of coping no attempt was made to assess trait characteristics such as repression or sensitisation. The importance of these characteristics is recognised, but the scarcity of reliable links between dispositional and strategic aspects Cohen and Lazarus (1980) and the problems of measurement of these aspects placed the focus on the coping strategies actually used rather than individual coping styles.

Ways in which individuals coped with the stress imposed by their condition and the practical problems arising from physical disability were recognized as potentially influential during the process of recovery. But because of the scarcity of appropriate tools of measurement for assessing coping strategies, available in 1977 when this thesis was planned, it was decided as a first step to investigate ways in which individuals were coping with physical disability without relating it to outcome.

Because of the multidimensional nature of coping processes and the differing values and perspectives of the adaptiveness or maladaptiveness of ways of coping, it was not possible to form hypotheses about the outcome of different coping strategies and examine coping as a predictor of the results achieved. Hypotheses therefore related to ways of coping with physical disability and were as follows:

1. Variability would be found in strategies used by subjects

but some ways of coping with physical disability would be identifiable.

2. That professional staff and individual subjects would have different opinions about ways of coping that were adaptive or maladaptive at any one time.
3. That coping themes identified by Ray et al. (1982) in subjects with other conditions would also be found in these groups of subjects with physical disability.

Investigation of coping in recovery from physical disability

At initial interview in the main study, all subjects were asked to discuss their condition, their feelings about the situation in which they found themselves and how they were coping with the problems arising from the physical disability imposed by their condition. Material from these semi-structured interviews formed the basis for the investigation. The short comings of this method are that aspects of coping may not always be explicit, but the lack of other more suitable methods left few alternatives. Two aspects were examined, the existence of the themes proposed by Ray et al. (1982) and ways of coping that might be identified from patients' statements.

Method.

The interview which provided the material for analysis were undertaken as follows. On referral for physiotherapy treatment subjects were interviewed using a semi-structured format with the following probe questions:

1. Will you tell me about your condition and how it happened?
2. Can you tell me how a) you felt about it when it first happened
   b) and how you feel now?
3. What do you think is the best way to cope with this stroke/ fracture that has happened to you?
4. How are you managing a) with day to day tasks
   b) looking after yourself?

The interviews were all recorded. Discussion took place with staff about the adaptiveness of coping of subjects.

Subjects.

The main study population see p. 14

Two independent judges - a psychologist and a physiotherapist.

Materials.

Typescripts of taperecorded interviews.

Procedure.

Interview material was studied to find if the six themes of rejection, control, resignation, minimisation, dependency and avoidance were to be found in the transcripts.

The themes suggested by Ray et al. (1982) and the examples given of cancer and surgical patients were studied by the author and two independent judges. Agreement was reached on the type of statement which reflected the themes. Transcripts of the interviews with the 40 subjects were studied independently by the judges, who marked any themes and indicated which theme the statements represented.

Staff who were caring for subjects in the study were asked in semi-structured interviews what they thought were adaptive and maladaptive ways of coping with physical disability and how adaptive they thought the behaviour of patients in their care was.

Results.

Table 37 gives details of the frequency of occurrence of the themes found in the interview material by the three judges.

Table 37

Frequency of occurrence of themes

	Avoidance	Rejection	Control	Resignation	Minimisation	Dependency
Stroke group n = 20	0	9	12	16	12	16
Wrist group n = 20	0	8	10	9	14	8

Examples of the themes identified by the judges are given separately for stroke and wrist subjects and listed under thematic headings:

Stroke Group

Rejection

1. I just can't accept that my arm won't get better, if I was older it would be different.
2. I'm not going to accept something like this, I just want to get out, they're kind but nothing is helping, I must get out.

Control

1. What's physically happened must have some sort of effect on what you can or can't do, but what you achieve from then on is largely in your hands.
2. The only way to get better is being determined, I do everything possible that I know to get movement. I work everthing out to my own method then I can do it. If I've got a problem, I sit down and think the best way to do it, try it out, if it doesn't work I sit down and think again and work it out.

Resignation

1. Well it's happened, you can't get away from that, you've just got to build your life round it. It's silly to say I'm not

disabled when I am. Lots of things happen in one's life, things that have to be overcome. I accommodate to what's happened and assimilate it into my way of life.

2. Whatever happens to me, it's for the best and I just accept it

Minimization

1. It's just a nuisance really. I just can't move, that's all there is to it. I'm not ill, just disabled so I'll get on with it.
2. Everything is absolutely fine, I've no problems at all, no not worried, I shall be fine. (This subject had a severe stroke plus pneumonia at the time of interview).

Dependency

1. I'm depending a lot on the staff here to get me better, there's not much I can do on my own at the moment.
2. My efforts may be important, but not to the extent of what others can do for me.

Wrist Group

Rejection

1. Nothing is going right, I think I'll sue them, it wasn't properly set and now I haven't had a second X-ray, its gone on so long I wish I was dead.
2. In the beginning it was so painful and everything, every little thing was so difficult. My husband does very little, I really felt at Christmas I wouldn't have minded dying.

Control

1. Its what you do yourself that matters, if I stayed like this and did nothing it would just stay like that, but I manage to do a little more each week.
2. Its really a question of working out how you're going to manage. I'm wearing clothes that are easy to get on and off and food

I can manage without cutting up.

Resignation

1. I suppose its really just a question of putting up with it till it gets better.
2. I just get on with the things I have to do, it hurts and it takes longer, but things have to be done if you live on your own.

Dependency

1. I couldn't do anything, anything at all. My husband helped with every little thing. I have great faith in Val (the therapist) she will get me better.
2. Disruption in my life was complete at first, I could do nothing at all. My husband and family did everything. I couldn't drive, do any work at home, even typing I couldn't do.

Because a number of different themes were found for each individual a direct relationship between the occurrence of one theme and outcome measures was not expected. However, since the extent of perceived control, in terms of Recovery Locus of Control Scores, was found to be related to some attainment scores, the relationship between the occurrence of the theme control was examined in relation to attainment scores of clinical indices. The point biserial correlation was calculated, it was not significant for any attainment scores in wrist group subjects, but was significant at .05 level for Gross Body Movement Independence in stroke subjects (see Table 38).

Because the theme dependency was considered to be opposite to the theme of control and for no two subjects did both control and dependency themes occur, dependency was examined in relation to attainment measures and a negative relationship was expected. But no significant relationships were found in either group. See Table A16, p. 248.

Table 38

Relationship between attainment scores and theme control

Stroke Group

Attainment Scores	t
GBM Dis	0.2641
GBM Ind	2.4361 *
Q.A.	0.1497
Q.L.	0.2590
P. care	0.1892

df = 10

* = p > .05

Wrist Group

Attainment Scores	t
Flex/pro	0.1425
UD/RD	0.1376
Sup/Ext	0.6782
Grip	0.7941

df = 12

Examining the occurrence of the theme control with scores on the R.L.O.C scale using the point biserial correlation, t was 2.357 significant at the 0.5 level for stroke subjects (df = 10) but t was 0.1216 for wrist subjects and therefore not significant (df = 12). For dependency see Appendix p. 248.

Way of coping with tasks

Analysis of interview material of subjects in the Wrist Group demonstrated that in general three different approaches to specific problem tasks were used - avoidance, by which in some way the task

was avoided, adaptation, where means were found by different problem solving soluations to perform the task, and thirdly seeking help from someone else. See Table 39 for examples. Though most subjects exhibited one main approach on each occasion, more than one was in evidence at different times during recovery, and sometimes in dealing with different tasks.

Table 39

Ways of coping with tasks

Dressing	For women fastening a brassiere was particularly difficult.	
	Avoidance:	stopped wearing a brassiere for the time being.
	Adaptation:	managed usually by putting on back to front, fastening in front and pulling round to the correct position.
	Seeking help:	asking husband/neighbour/nurse to do it up.
Household tasks	Preparing food	
	Avoidance:	change diet, eat only those foods that need little or no preparation, use of packaged pre-cooked foods.
	Adaptation:	bought special wall can opener, developed gadget for holding food for cutting, arranged a board to slide saucepans from stove without lifting.
	Seeking help:	asked husband/neighbour to do it.

These ways of coping were not identified in the Stroke Group subjects - as they were in hospital, ways of coping were influenced by ward routines and opportunities for using alternative strategies were strictly limited.

Adaptiveness of different methods of coping

Staff

Stressed the necessity for reality orientation in coping. Recognizing what was wrong and being realistic about future prospects. This 'realism' was clearly based on staff perceptions. Not getting upset was important in coping, open manifestations of grief were regarded as a breakdown in coping. Cheerfulness was regarded as adaptive.

Subjects

Reports here concentrated on the individual approach, coming to terms with what has happened was frequently mentioned. Mr H, commented 'you have to accommodate to what has happened, the disability, then assimilate it into yourway of life so that you can still have a way of life that is satisfying'.

Another subject, Mr E, who was unable to stand following a severe stroke repeatedly told staff 'don't worry, I shall be back at work in 2 weeks'. This was considered by staff as very unrealistic and maladaptive. Six weeks later Mr E explained that he knew at the time his remarks were not true, but saying he would soon be back at work helped him to come to terms with his situation.

Discussion

Considerable variability was found in the ways in which subjects coped with physical disability. Overt strategies were identified in wrist patients only - this may have been because stroke patients were much more strictly limited in their behaviour which was often governed by ward routines and staff procedures, help being given as a matter of routine because this was quicker than letting the patient have the time to do it themselves.

When the occurrence of themes was examined, it supported the Ray et al. (1982) results that it was rare for a patient to show less

than two or three themes. When the themes of control and dependency were examined in relation to outcome measures and perceived locus of control few significant relationships were found. This may have been because one theme did not predominate; a direct relationship between the occurrence of one theme and outcome measures would not necessarily be expected to occur.

Piaget's notion (1957) of accommodation and assimilation provides a useful analogy where a state of equilibrium is seen as necessary for the individual to function effectively. One subject spontaneously used the term accommodation to describe his own way of coping, 'accommodating to disability is important.' Disequilibrium occurs following the onset of the condition, the individual must then assimilate changes that have occurred within his system, equilibirum is only restored when these changes are accommodated within total life style.

Five of the six coping themes identified by Ray et al. (1982) in breast cancer and surgical patients were found to be present in both the stroke and the wrist group of subjects. Avoidance was not found as a theme, in either group, in subjects with physical disability with overt symptoms direct avoidance may have been difficult.

In general staff and subject's opionions about adaptability of coping strategies differed, staff emphasising the importance of 'reality' but this reality being their perceptions of the situation, often based on objective severity of physical symptoms. Subjects stressed the individual approach. Mr E's case illustrates this well, and is an example of emotion focussed coping (see p 152) gradually coming to admit his state of disability, this possibly analagous to denial, but also reminiscent of Middle Knowledge as described by Weisman (1972) in relation to dying - 'somewhere between open

acknowledgement and its utter repudiation is an area of uncertain certainty called Middle Knowledge.'

In conclusion, coping strategies are seen as an important potential influence on the process of recovery. Their effect was not clearly demonstrated in this thesis, this may have been partly because of the number of different strategies used by any one individual, Lazarus et al. (1974) suggest that 'consistency is the exception rather than the rule'. Though it may be difficult to disentangle the different strategies used and relate them to outcome, Greer et al. (1979) found in a prospective study of patients with breast cancer a statistically significant association between outcomes at 5 years and response to confirmation of the diagnosis of breastcancer. Those who demonstrated responses categorized as denial or fighting back doing significantly better than those with responses categorized as stoic acceptance or feelings of helplessness, hopelessness. It would be interesting to repeat their study with patients with physical disability.

Chapter 4

Emotion

This chapter discusses theoretical approaches to the concept of emotion,and experimental work on emotion as a factor in recovery from illness. On the basis of this work, hypotheses are proposed about the influence of emotion on recovery from physical disability, and are tested with the study population of subjects with physical disability; the methodology used and the results obtained are presented and discussed.

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Theoretical approaches to the concept of emotion have varied widely, and emotions themselves are notoriously difficult tó define. Current theories include the following: emotion viewed in terms of biological and evolutionary factors Plutchick (1970), intensity of activation Duffy (1962), neural and physiological correlates Pribam (1970) and information processing Lazarus (1968).

The early work of James, Lange, and other peripheralists view reactivity of viscera and skeletal muscles as salient features of emotion, while central theorists consider physiological arousal in a minor role, because the individual experiences emotion regardless of bodily changes. The influence of cognitive processes is all important in central theories of emotion.

Emotion has been perceived as drive motivating behaviour. Here the work of physiological psychologists suggests that the cerebral cortex in man and animals may function more effectively when the amount of stimulation reaching the cortex from the ascending reticular system is at a moderate level, rather than at a very high or very low level Hebb (1955) Schlosberg (1954) Malmo (1959).

Within this curvilinear theory emotion may be both motivating or disruptive, depending on its level. In Leeper's (1948) study high levels of fear disrupted behaviour, Murray (1948) also demonstrated high levels of anxiety as disruptive, but also in some instances producing new goal directed forms of behaviour. The Yerkes Dodson Law (1908) maintains that a moderate degree of anxiety facilitates behaviour, the level at which it is facilitative depending on the task: task difficulty interacting with levels of anxiety

Appraisal as central to emotional responses was first put forward by Arnold (1960) who proposed that most emotions initially involve intuitive appraisal of a stimulus as good or bad, beneficial or harmful, each emotional reaction being a function of a particular kind of cognition or appraisal. Lazarus and Launier (1978) have elaborated the concept of appraisal as an integral part of an emotional response, especially in the context of the threat and stress of illness. The position that cognition always precedes emotion has been challenged by Zajonc (1984) who maintained that affect and cognition are separate and partially independent systems, and that emotion can at times precede cognition in a behavioural chain. However, he accepted that in most circumstances cognition and emotion function conjointly and that the issue cannot be fully resolved until there is a full understanding of consciousness.

Strong emotional reactions may be aroused by illness - appraisal of symptoms and consideration of their personal significance may arouse fear, anxiety, guilt, sadness and depression. These emotional responses may of themselves disrupt behaviour, Emotion-focused coping, that is controlling emotional responses that are potentially or actually disruptive is seen as an important part of coping behaviour by Lazarus and Launier (1978).

The emotional responses to illness of organic origin that have been most frequently studied are anxiety and depression, and these are discussed in more detail.

Anxiety

Anxiety is closely allied to the emotion of fear, sometimes they are distinguished by considering anxiety as free-floating and generalised whereas fear is related to a specific object. At a theoretical level anxiety involves complex multi-dimensional concepts. The dispositional or personality aspect has been differentiated from the situational response by Spielberger (1972). A-trait reflecting the individual differences in anxiety proneness a relatively stable personality disposition, and A-state the transitory level of anxiety which varies with the circumstance, being low under circumstances of low threat, raised under high threat conditions.

Anxiety is an almost universal reaction to illness, Viney and Westbrook (1982), it is reported in subjective accounts, Lipowski and Stewart (1973), descriptions by observers Ezra (1969), Farber (1978) and found in experimental studies, Stocksmeier (1976), Byrne and Whyte (1978).

Anxiety and recovery from surgery.

Numerous studies have investigated the relationship between pre-operative levels of anxiety and recovery variables. Cohen and Lazarus (1980) comment on the difficulty of interpreting the results of many of these studies because they are confounded by the use of both trait and process measures of anxiety.

In one of the first studies to examine psychological process variables and post-operative emotion states, Janis (1958) offered empirical evidence in support of his hypothesis of a curvilinear relationship between pre-operative levels of fear and post-operative recovery. Two groups of subjects were divided into low, moderate and high fear groups based on levels of anticipatory fear before surgery. Results post-surgery were different for the three gorups, those with moderate levels of anticipatory fear achieving the most beneficial recovery. Janis (1958) proposed that the 'work of worry' was beneficial as a preparation for the ordeal of surgery, moderate levels of fear facilitating adaptive behaviour. This curvilinear relationship has not been supported in other studies, but there is evidence to support the existence of linear relationships, with higher levels of anxiety pre-operatively associated with higher levels of anxiety post-operatively.

Williams et al (1972) suggest that the level of pre-operative anxiety affects the patient's physiological status at the time of operation, and high pre-operative anxiety may persist throughout the operation and into the post-operative period.

Johnson et al (1971) provide some of the strongest support for the existence of a linear relationship between pre-operative anxiety and post-operative emotionality. In their study 62 patients were divided into three groups on the basis of their level of pre-operative anxiety as measured by a mood adjective check list and a list of pre-operative worries. They reported finding significant differences between the three groups on post-operative measures of fear, lethargy, anger, and pain, no differences being found in reported well-being, use of analgesics or length of hospital stay. In comparing the high anxiety group with the two lesser anxiety

groups, the more anxious pre-operatively the worse the outcome post-operatively.

Sime (1976) also divided her 57 subjects into three equal groups on the basis of a pre-operative fear scale. A linear relationship was found between these levels and negative post-operative affect and other recovery measures, including length of hospital stay and number of analgesics. These and other studies such as those of Cohen and Lazarus (1973), Wolfer and Davis (1970) and Johnston and Carpenter (1980) suggest that pre-operative emotional levels are significantly related to post-operative emotional state and other recovery variables.

In open-heart surgery the results are contradictory. Layne and Yudofsky (1971) reporting low fear related to most post-operative delerium while Morse and Litin (1969) and Kimball (1969) report low fear associated with least post-operative delerium; Kornfield et al (1974) finding no significant relationships. Boyd et al (1973) however found that those with higher levels of pre-operative anxiety took longer to return to an active life style after reconstructive vascular surgery.

Anxiety and other conditions.

Viney and Westbrook (1982) in examining patterns of anxiety in chronically ill patients found complex inter-relationships between patterns of anxiety and physical and social factors. The first pattern of anxiety was specifically related to decreased mobility because of physical disability; if rehabilitation was not seen as progressing well, this was also a major source of anxiety. Panchieri et al (1978) in recovery from myocardial infarction reported a more complicated course of recovery in subjects higher on both state and trait measures of anxiety, but this was not

demonstrated in Rosen and Bibring's 1966 study. Overall the results of these studies are not clear and unambiguous and interpretation is confounded by the use of different types of measures to examine the emotional response and the different types of recovery variables used.

Depression

The term depression refers primarily to mood which can vary from feelings of slight sadness to utter misery and despair. It is conceptualised as being of two types - endogenous and reactive. Endogonous where there is no obvious external cause for a shift in mood, reactive where such a cause can be identified. Dominian (1976) described depression as 'an invasion of personality by a disintegrating force with multiple psychological and physical characteristics subtly intertwined'.

The relationship between depression and physical illness is not clear cut.

Depression and physical illness.

In examining patients with Parkinsonism and other disabling diseases, Robins (1976) found that patients with Parkinsonism were significantly more depressed than patients with other disabling diseases, the author attributed this difference to pathological changes specific to the disease. But an interesting fact in the results was that for both groups of patients degree of depression was unrelated to severity of disability, this possibly suggesting that individual perceptions of disability may have differed from objective measurements of severity.

The results of studies examining the relationship between depression and recovery from heart surgery are unequivocal. Gilbertson and Sako (1967) report a number of studies where subjects who scored high on the D Scale of the M.M.P.I. did not have greater morbidity following open heart surgery. However, Kilpatrick et al. (1975) and Kornfeld (1974) found a statistically suggestive relationship between ratings of depression and post-cardiotomy delerium.

Selzer et al. (1978) reported finding a positive relationship between depression and physical health, this evidenced by visits to the health centre and absenteeism from work.

Emotional responses and cognitive appraisal.

Emotional reactions to stress have been shown to vary as a function of psychological variables that can be modified even though the nature of the threatening event remains the same. Pervin (1963) demonstrated a lowering of emotional responses by increasing perceived control over an aversive stimulus. Andrew (1970) using information giving as a stress reduction method prior to surgery, divided subjects into three groups on the basis of personality measures and found differing results in the three groups. Sensitizers and avoiders, the two extreme groups did worse than the in-between group - the sensitized group given information did not differ from the no information group. The avoiders requiring more medication following information; the middle group recovering in less time and requiring less medication when instructed than when not instructed. Cognitive factors clearly influencing the type of recovery but in different ways for those belonging to different dispositional groups. Subjects who were taught to exercise cognitive control through selective attention - cognitively re-appraising the threatening event of

the surgery - had a more beneficial process of recovery following that surgery, and reported lower emotional levels of response Langer et al. (1975).

Assessment and Measurement of Emotion

The most widely used approaches to the measurement of levels of emotional arousal have been physiological and psychological. The physiological indices most commonly measured have been blood pressure, heart rate, respiratory rate, and electrical skin resistance, but the results of these tests have on the whole been disappointing Levitt (1971). This because they are seldom related to each other, to psychological indices, or to objective intensity of stress.

Psychological methods for measuring emotion have been of three main types, projective tests, inventories and adjective check lists.

Projective tests. These are unstructured or only partly structured, the Rorschach ink blot test is probably the most widely used. The advantage of these techniques is that the subject rarely has any idea of the interpretation of his responses and therefore cannot 'fake good'. However, despite its wide clinical use, where the meaning of the test can be revealed in the context of detailed study of the respondent, the lack of quantification of results and the different interpretations possible make it unsuitable for most research purposes.

Inventories and Questionnaires. These have the advantage of ease of administration and quick and easy scoring. However, there are a number of problems associated with their use, the common use of denial as a defense against awareness of anxiety, response

acquiescence and the effect of social desirability. Among tests which are widely used are Taylor's Manifest Anxiety (T.M.A.) (1953) constructed from items of the Minnesota Multiphasic Personality Inventory, consisting of forced choice items which to some extent eliminate the social desirability effect. The test produced by the Institute of Personality and Ability Testing and that of Cattell and Schier (1961) are also used frequently, but these and T.M.A. were developed for use with patients with anxiety of psychiatric origin and concentrate on the dispositional aspect of anxiety. The state-trait adjective inventory S.T.A.I. of Spielberger et al. (1970) claims to measure both trait and state anxiety.

Adjective check lists. Amongst those most widely used are Zuckerman (1960), Nowlis (1966) and McNair et al. (1980). These check lists are easy to administer providing the subjects have an adequate vocabulary and verbal fluency, but an individual who defends himself against anxiety by denial or repression may score low on a check list even though very anxious.

A factor which must be taken into account when examining the results of adjective check lists is social desirability.

Social desirability.

It has been recognised for many years that scores on psychometric tests are influenced by non-test relevant determinants. Three main approaches to the problem were outlined by Wiggins and Rumrill (1959), attempts at statistical correction for 'faking' good or bad Meehl and Hathaway (1946), analysis of response sets Cronbach (1950), and ratings of social desirability of test items Edwards (1957). These approaches reflect both the social desirability of the test items, and the behaviour of the subject in

responding to these test items.

Crowne and Marlowe (1960) produced a scale of social desirability which was developed to avoid the ambiguities of the statistical deviance approach (Marlowe Crowne Scale - M.C.S.). The authors state that the items consist of those which are culturally sanctioned and approved, the rationale underlying the scale is that of the lie scale of the M.M.P.I. but less extreme. The scale is intended for and was tested with a population without significant psychiatric pathology and using the Kuder Richardson formula the internal consistency co-efficient was .88, a test-re-test of .89 was obtained. The authors claim that in the development of the M.C. Scale social desirability is designed more broadly to refer to the need of subjects to obtain approval by responding in culturally appropriate and acceptable ways, the conception does not involve acquiescence or denial by the subject of pathology. Socially undesirable responses on the MCS do not imply maladjustment. The M.C. Scale correlates with 17 M.M.P.I. validity clinical and derived scales, and with the Edwardes Social Desirability Scale (S.D.S.). The S.D.S. refers more to the scale value of an item indicating the position of the statement on the social desirability continuum rather than to the needs of subjects as the M.C. does.

Emotion and recovery from physical disability.

The situation of recovery from physical disability cannot be considered in the same way as recovery from surgery, because pre-onset measurements are not available. However, the relationship between levels of emotion post-onset and recovery variables was of interest to find if emotional responses would predict aspects of recovery.

In line with work previously cited, a number of hypotheses were proposed.

1. That appraisal would be linked to overall emotional response, those who appraised their condition as more serious would also report higher levels of emotional arousal.
2. That those who perceived themselves as more changed through the onset of their condition - as measured by repertory grids - would also report higher levels of emotional arousal.
3. That higher levels of emotional arousal would be associated with lower levels of performance. The high emotional levels disrupting attention and therefore performance.

Measurement of emotional state of subjects with physical disability

Since it was emotional responses rather than psychiatric state that were of interest, a mood adjective check list was selected to examine the mood states of the subjects. McNair Lorr and Droppleмann's (1980) Profile of Mood States (P.O.M.S.) was chosen because the words used resembled those spontaneously used by similar groups of subjects in an earlier study, Partridge (1983). P.O.M.S. was developed from work with a number of different groups of subjects, it was easy and quick to use in the clinical situation, 3-5mins, and provided information about a number of mood factors and of overall mood disturbance. It was recognised that for some subjects social desirability might be affecting responses, and therefore the last 21 subjects were asked to complete the Marlowe Personal Inventory Reaction in order to find out if there was a relationship between reported levels of mood state and social desirability. It would of course have been preferable for it to have been included for all subjects.

Profile of Mood States (P.O.M.S.)

The 41 item scale measures six identifiable mood or affective states, five of these were used: tension/anxiety, depression/dejection, anger/hostility, vigor/activity, fatigue/inertia. The present (1981) form represents the refinement of a total of 100 different adjective scales by repeated factor analysis. The five mood states are described as follows by the authors:

1. Tension/anxiety.

Factor 1 is defined by adjective scales descriptive of heightened musculoskeletal tension, correlations of the scales with the factors were reported in six studies.

2. Depression/dejection.

Factor D appears to represent a mood of depression accompanied by a sense of personal inadequacy - again replication in six studies.

3. Anger/hostility.

Factor A represents a mood of anger and antipathy towards others and describes feelings of intense overt anger. The factor correlations of angry, furious, ready to fight are consistent over six studies.

4. Vigor/activity.

Factor V defined by adjectives suggesting a mood of vigorous ebullience and high energy this factor was replicated in all six studies.

5. Fatigue/inertia.

Factor F represents a mood of weariness inertia and low level energy. It has been confirmed in six studies. Factor F appears to be negatively related to Factor V but independent, the two are not opposite poses of a single bipolar factor.

Highly satisfactory reliabilities are reported by the authors with the indices of the extent to which individual items within

the mood scales measure the same factor near .90 or above. Test-re-test reliability estimates ranged from .65 for vigor to .74 for depression.

Examination of individual items defining each mood scale supports face or content validity of factor scores. Three areas of research have provided evidence for predictive and constructive validity of POMS brief psychotherapy studies Lorr and McNair (1964), Haskell et al. (1969); controlled out patient trials McNair et al. (1965). Studies of emotion inducing conditions, Pillard et al. (1967) means for college studients were markedly different from those of psychiatric patients, vigor, depression and tension discriminated most clearly. Normative data are not available for a directly comparable group to that of the present study a group of patients presenting with overt physical symptomology.

A total mood disturbance score (TMD) is justified if there are high intercorrelations between individual mood factors. A TMD score is obtained by summing across all factors with Vigor negatively weighted. McNair et al. (1980) suggest that when a single global estimate of affective state is required the TMD provides an appropriate measure.

Marlowe Crowne Personality Inventory Reaction.

Consists of 33 items reflecting behaviours which are culturally sanctioned and approved, but which are improbable of occurrence. The rationale is the same as that underlying the Lie scale of the MMPI, though the items are less extreme than the Lie items. The items have minimal pathological or abnormal implications if responded to in either socially desirable or undesirable directions.

The total score reflects the extent to which the individual seeks to present themselves in a favourable light. A high score indicating a strong need for social desirability.

Both the P.O.M.S. and the Marlowe Crowne Personality Inventory were used with the study population.

1) Assessment of Mood (P.O.M.S.)

Methods.

Subjects completed the P.O.M.S. at their first interview.

Subjects.

Main study population see Chapter 1 p.14.

Materials.

41 items of P.O.M.S. listed were as follows:

Gloomy	Discouraged	Spiteful
Relaxed	Carefree	Sleepy
Restless	Tired	Active
Guilty	On edge	Afraid
Furious	Desperate	Worn out
Panicky	Lonely	Full of pep
Nervous	Worthless	Annoyed
Lively	Terrified	Weary
Hopeless	Vigorous	Alert
Sluggish	Uneasy	Resentful
Helpless	Ready to fight	Fatigued
Angry	Deceived	Shaky
Anxious	Miserable	Grumpy
		Unhappy
		Tense

Each word was printed on a plain white cared 4" x 3".

Four possible ratings were offered for each word as follows:

Not at all A little Quite a lot Extremely

Procedure

Subjects were given the following verbatim instructions:-

These are words that describe feelings people have.
Please read each one carefully and then place the card under the heading which best describes how you have been feeling during the past week including today

Four headingsgiven were:

not at all

a little

quite a lot

extremely

The items on the P.O.M.S. were presented to the subjects on cards and they were asked to sort them into the 4 categories.

2) Marlowe Crown Personality Inventory Reaction

This was given to the last 21 subjects to enter the study. It was decided to use this Inventory when the first 19 subjects had completed the P.O.M.S. and appeared to differ in the extent to which they thought it permissable to admit to different mood states.

Method

Subjects were asked to complete the Inventory at the second interview, two weeks after entering the study.

Subjects.

n = 21. Subjects from the main study population see Chapter 2.

10 Stroke Group)
) Age Range 50-72
11 Wrist Group)

5 male, 16 female.

Materials.

The following 33 items:-	True	False
1. Before voting I thoroughly investigated the qualifications of all candidates.		
2. I never hesitate to go out of my way to help someone in trouble.		
3. It is sometimes hard for me to go on with my work if I am not encouraged.		
4. I have never intensely disliked anyone		
5. On occasions I have had doubts about my ability to succeed in life.		
6. I sometimes feel resentful when I don't get my own way.		
7. I am always careful about my manner of dress.		
8. My table manners at home are as good as when I eat out in a restaurant.		
9. If I could get into a movie without paying and be sure I was not seen I would probably do it.		
10. On a few occasions I have given up doing something because I thought too little of.		

	True	False
11. I like to gossip at times		
12. There have been plenty of times when I felt like rebelling against people in authority even though I knew they were right		
13. No matter who I'm talking to, I'm always a good listener		
14. I can remember 'playing sick' to get out of something		
15. There have been occasions when I took advantage of someone		
16. I am always willing to admit it when I make a mistake		
17. I always try to practice what I preach		
18. I don't find it particularly difficult to get along with loud mouthed obnoxious people		
19. I sometimes try to get even, rather than forgive and forget		
20. When I don't know something I don't at all mind admitting it		
21. I am courteous, even to people who are disagreeable		
22. At times I have really insisted on having my own way		
23. There have been occasions when I felt like smashing things		
24. I would never think of letting someone else be punished for my wrongdoings		

	True	False
25. I never resent being asked to return a favour.		
26. I have never been irked when people expressed ideas very different from my own.		
27. I never make a long trip without checking the safety of my car.		
28. There have been times when I was quite jealous of the good fortune of others.		
29. I have almost never felt the urge to tell someone off.		
30. I am sometimes irritated by people who ask favours of me.		
31. I have never felt that I was punished without cause.		
32. I sometimes think when people have a misfortune they only got what they deserved.		
33. I have never deliberately hurt someone's feelings.		

Procedure.

Subjects were given the following verbatim instructions: 'Listed are statements concerning personal attitudes and traits. Read each item and decide whether the statement is true or false as it pertains to you personally, and mark a tick against the statement in the appropriate column.'

Results.

The means and standard deviations of the scores on the P.O.M.S. are given in Table 40, full details are given in the appendix p. 236, 242.

Table 40.

Scores on mood factors of P.O.M.S.

Mood factors	Wrist Group Scores			Stroke Group Scores		
	Mean	S.D.	Range	Mean	S.D.	Range
Tension	5.0	4.8	0-17	5.7	4.2	2-14
Anger	3.4	3.1	0.11	3.6	3.3	0-10
Fatigue	4.8	4.7	0-16	5.7	3.9	0-15
Vigor	5.3	3.8	0-13	4.5	4.9	0-17
Depression	4.7	6.1	0-17	6.6	4.8	0-16
	n = 20			. n = 20		

Scores covered similar ranges in both groups but were higher on fatigue and depression and lower on vigor in the stroke group.

The raw scores of the 21 subjects who completed the Marlowe Crown Personality Inventory reaction are given in the appendix p. . The mean, range and standard deviation are given below:

M.C.

Mean	=	20
Range	=	10-27
Standard deviation	=	4.8

Spearman's correlation co-efficients were computed to examine the intercorrelations between scores on the five mood factors of P.O.M.S. for both Groups. Results are given in Table 40. Because of the lack of significant correlations between mood factors in the Stroke Group T.M.D. scores are given only for Wrist Group subjects.

Intercorrelations between scores on the different mood factors were examined using Spearman's Rho. Correlation-efficients are given in Table 41.

Table 41.

Intercorrelations between Mood Factors of P.O.M.S.

STROKE GROUP	Tension	Anger	Fatigue	Vigor	Depression
Tension	1.0	.31	.37*	- .11	.5
Anger	.31	1.0	- .008	.31	.09
Fatigue	.37*	- .01	1.0	- .23	.22
Vigor	- .11	.31	- .23	1.0	- .34
Depression	.53*	.09	.22	- .34	1.0
WRIST GROUP					
Tension	1.0	.47**	.73***	- .45*	.89***
Anger	.47**	1.0	.39	- .12	.51**
Fatigue	.73***	.39	1.0	- .27	.73***
Vigor	- .45*	- .12	- .27	1.0	- .39
Depression	.89***	.51**	.73***	.39*	1.0

* $p < .05$

** $p < .01$

*** $p < .001$

Intercorrelations were significant for most Factors in wrist group subjects and therefore in this group only a total mood disturbance (T.M.D.) score is therefore justified.
but not for the stroke group where fewer significant intercorrelations were found.

The relationship between scores on the Marlowe Crowne personality inventory and the five mood factors was examined, again using Spearman's Rho. Results are given in Table 42 and show that no significant correlations were found.

Table 42.

Correlations between Marlowe Crowne and Mood Scores.

	Tension	Anger	Fatigue	Vigor	Depression
Marlowe Crowne Score	- .15	- .05	- .05	.2	- .17

n = 21

To find out about the relationship between mood factors and, perceptions, attainment scores, personal care scores, and construct ratings, Spearman's correlation co-efficients were computed using S.P.S.S. (1975) results are given in Table 42.

Table 43.

Correlations between mood factors and other variables

Stroke group.

	Tension	Anger	Fatigue	Vigor	Depression
Rated as more serious	.39*	.13	.31	-.44*	.38*
Rated as less healthy	.18	-.26	.01	-.54**	.39*
Attainment - GBM Dis.	-.01	.09	.09	.20	.11
GBM Ind.	-.11	-.34	-.45*	-.14	-.18
Personal care - Ass. 1	.09	-.15	-.37*	.29	-.04
2	-.06	-.08	-.43*	.36*	-.20
Personal Construct - Rating 1	.24	-.01	.29	-.58**	.50*
Rating 2	.33	-.05	.19	-.69**	.53*

Wrist group.

						T.M.D.
Rated as more serious	.22	.15	.18	-.06	.38*	.54*
Rated as less healthy	.69**	.26	.52*	-.59**	.57**	
Attainment - Flex/pro	-.39*	-.07	-.14	.02	-.33	-.01
U.D./R.D.	.25	.13	-.2	.08	.24	.11
Sup./Ext.	-.19	-.19	-.03	-.25	-.12	-.05
Grip	-.51**	-.22	-.53**	.01	-.45*	-.47*
Personal care - Ass. 1						
2	-.02	-.39*	-.02	.15	-.08	-.24
More activity restriction					.55**	.60**
Personal Construct - Rating 1	.72***	.49*	.68***	-.59**	.70***	
Rating 2	.66**	.44*	.61**	-.64**	.61**	

* p <.05 ** p <.01 *** p <.001

The pattern of intercorrelations in both stroke and wrist group was somewhat similar with more significant correlations being found between perceptions and construct ratings and mood factor than between mood factors and attainment scores.

Discussion.

The scores on the P.O.M.S. showed the two groups had different emotional responses to their condition, with, not surprisingly, a greater response in the Stroke Group. However, looking at individual scores (see appendix p.) some of the most extreme scores were obtained from subjects in the wrist group.

Intercorrelations between mood factors (see Table 41) were not found to a great extent in the stroke group, except between tension, fatigue and depression, but highly significant intercorrelations were found between all mood factors in the wrist group subjects. The use of a total mood disturbance score would be justified only with wrist group subjects.

Seeing one's condition as more serious was related to some aspects of emotional response in both groups but the association was stronger in the stroke group. For both groups depression was positively related to greater perceived seriousness, tension for the stroke subjects was also positively related to perceived seriousness.

The significant relationship between perceived seriousness and vigor was a negative one. These results provide some support for the hypothesis that perceiving one's condition as more serious would be related to the level of emotional arousal. Perceptions of self as healthy showed a similar relationship to emotional responses. Seeing oneself as less healthy being related to a greater emotional

response. Examining the relationship between perceived change in self through the onset of the condition and emotional responses (see Table 43) also highlights the differences between the groups, though there is some evidence for both groups that 'seeing oneself as more changed' was related to level of emotional arousal on some factors. The relationship was much stronger in the wrist group with all mood factors, except vigor, being related to perceived change, for the factor vigor, scores were negatively related to perceived change.

Looking at the groups as a whole, there was not overall a strong relationship between level of emotional response and attainment scores, nor clear evidence of a linear relationship between level of emotional response and attainment.

The relationships between emotional responses and other recovery variables were clearer in wrist group subjects with strength of grip being significantly negatively related to tension, fatigue and depression. Depression was significantly related to restriction of activity, with more reported restriction of performance of activities related to both depression and total mood disturbance.

It would seem that emotional response to physical disability is intricately involved with the process of recovery, but because of the complexity of the situation and the many factors which interact, the exact nature of the relationship was not demonstrated in these groups of subjects. Further research is needed to examine the interrelationships, perhaps including more measures of performance of everyday activities for both groups. Also perhaps repeating assessments of mood and relating these to performance at different times during the process of recovery.

SECTION IV.

Chapter 1

Predictors of Recovery

Introduction.

To find if predictors of outcome could be identified among the psychological variables monitored during the process of recovery from physical disability, multiple regression analyses were undertaken. This type of analysis was considered most suitable because it seeks to account for variation in a criterion variable or variables, in terms of covariation with other variables. The purpose being to find a formula by which to estimate values of the criterion variable(s) from values of the predictor variable(s).

Method.

Three methods of regression analysis were used to obtain the most information from the data, and were as follows:

1. Forward inclusion - where independent variables are entered only if they meet certain statistical criteria. The order of inclusion being determined by the respective contribution of each variable to explained variance.
2. Backward elimination - where predictors are eliminated one by one from a regression equation that initially includes all predictors.
3. Stepwise solution - where forward inclusion is combined with deletion of variables that no longer meet the pre-established criterion at each successive step.

The regression sub-programs of the multiple regression analysis

of S.P.S.S. Nie et al. (1975) p. 345 were used.

Results.

Full tables of the results are given in the appendix pages 249 - 261 and a summary is given in Tables 44 and 45.

Table 44.

Summary table of significant psychological predictors (Stroke)

Psychological (Independent)	Criterion (Dependent) Variables		
	Methods of regression analysis		
	Forward	Backward	Stepwise
L.O.C.	GBM Dis.	Q.L.	
Tension			Q.A.
Anger		Q.A. Q.L.	
Fatigue	GBM Ind.		
Vigor			
Depression			
Personal construct ratings	GBM Ind.	P. Care 2	

GBM Dis. Gross body movement disability
GBM Ind. " " " independence
QA Quality arm movement
QL Quality leg movement

(Overleaf)
Sup/Ext)
UD/RD)Composite wrist movements.
Flex/pro)

Table 45.

Summary table of significant psychological predictors (Wrist)

Psychological (Independent) Variables.	Criterion (Dependent) Variables.		
	Methods of regression analysis		
	Forward	Backward	Stepwise
L.O.C.		Sup/Ext UD/RD Grip P. Care Flex/Pro	Grip
Tension		Sup/Ext Grip Flex/pro	
Depression		Flex/Pro	
Anger		Grip	
Fatigue		Sup/Ext	
Vigor		Sup/Ext P. Care	
Depression			
Construct ratings		Sup/Ext Restriction of Activity	

Discussion.

Psychological factors shown to be predictors of recovery from physical disability varied considerably in the two groups of subjects and with different methods of analysis. Overall, the two factors which came through most strongly in both groups were Perceived Locus of Control and the mood state of Tension. A stronger belief in personal control and less reported tension being predictive of more complete recovery during the given time periods.

It was interesting to note that though many of the mood factors

did not reach a significant predictive level they did on a number of occasions almost reach significance, see appendix pp. Maxwell (1977) suggests that in a prediction study the data available for setting up the regression equation refers to a highly selected population, rather than one that might be considered representative, and therefore the correlations between the predictor variables and the criterion are likely to be much smaller than they would have been with a larger more representative sample, and as a consequence the multiple correlation co-efficient obtained in the regression model will give an underestimate of the ~~time~~ value, and this may well be the case in this thesis.

The different results obtained by using the different methods of regression analysis may be seen as illustrating the complex nature of physical disability. Disability - restriction of performance of movements and activities may be conceptualised at different levels as discussed earlier. Firstly, disability reflects both impairment, damage to body systems and structures and the individual's response to this damage; his actual level of performance will reflect both. Secondly, disability is concerned with both restriction of performance of movements and of the more complex activities that use these movements. It is suggested that the performance of movements reflects impairment more directly, though there may be some influence from psychological and other aspects, but there will be a greater influence of these factors at the level of performance of activities. The data to some extent supports this. Construct ratings predicting later personal care scores in the stroke group and restriction of activities in the wrist group. Grip and personal care scores in the wrist group were predicted from perceived control and emotional factors.

The mood factor anger appeared as a predictive factor on several

occasions. This was not altogether surprising, as a number of subjects interpreted the items in the section of the factor anger of the profile of mood states as indicating a 'readyness to fight' and equated this to a positive approach to their problems, feeling capable of tackling the problems posed through the onset of their condition; and possibly related to perceived control. This characteristic of 'fighting back' was identified by Greer et al. (1979) in breast cancer patients, those who demonstrated this characteristic having a more beneficial recovery from surgery and irradiation, and a longer survival rate.

As perceived locus of control has been shown to be a predictor of later performance, it would be useful to test the hypothesis further by investigating whether interventions to change perceived locus of control could change beliefs and if these occurred, whether they were related to different types of outcome.

The general conclusion of this thesis from the investigation of the study population is that the recovery process from physical disability is complex and influenced by a wide range of factors, initial severity is not always a clear predictor of later performance and psychological factors contribute significantly to the variance observed in later performance. Some psychological factors have been shown to be predictors of later performance. Before generalisations can be made, the study should be repeated with larger groups of subjects and with subjects with different kinds of physical disability.

Chapter 2

General Discussion and Conclusions.

The proposition that individuals with similar conditions differ greatly in the course of their recovery was supported in this thesis. Both groups of subjects showed considerable variation in the course of their recovery, which could not be fully explained in terms of initial severity; initial severity of itself being a poor predictor of later disability.

Both mood states and personal construct ratings were shown to be related to some of the recovery variables. Mood states of tensionand Depression showing a negative relationship to indices of recovery, anger and vigor being positively related. It had been expected that tension and depression would have had a stronger relationship to the recovery process. One factor which may have contributed to underestimating emotional response was using a mood adjective check list to estimate mood. A number of subjects reported little emotional response, appearing to deny the extent to which they were tense or depressed; admitting to either was reported as being reprehensible and undesirable. Because of this the degree of emotional reaction may have been underestimated and the true relationship between mood and recovery variables not obtained. Using other less overt methods of assessing mood might gain a more accurate picture of emotional responses from these groups of subjects.

The personal construct ratings were related to mood state and to perceived seriousness, but not strongly to the recovery variables. This may have been because information on the subject's response to perceived change was not obtained. Perceiving oneself as more changed may stimulate greater efforts at problem solving, or alternatively overwhelm the individual and produce feelings of helplessness.

It would be necessary in the future to investigate this aspect. Using rating grids to investigate individual constructs in relation to physical disability proved a useful method of investigation.

The psychological variable that appeared to have the strongest predictive relationship with the recovery variables in these groups of subjects was perceived locus of control. Those who perceived more personal, more internal, control over recovery having less later physical disability. This finding supports other work in the field of health care, where greater perceived internality has been shown to be related to a number of aspects related to good health and wellbeing. It also supports the work demonstrating the relationship between greater internality and effective problem solving.

At a practical level the implications of these findings may mean that the traditional role of the health professional as in charge of the patient's treatment and management, may be less effective than one in which the individual's own control over their recovery from physical disability is emphasised. This needs to be tested, examining initial levels of perceived control, instituting a programme to encourage a belief in personal control over recovery, testing whether this effects beliefs, and if so examining whether these changes are related to later out come.

It could be suggested that the objective measures of severity do not accurately reflect underlying pathology but psychological factors such as perceived means of control do, that individuals are in some way intuitively aware of the underlying pathological severity of their condition. However this hypothesis is not testable at the present time as sufficiently sensitive methods of measurement of pathological severity are not available.

Coping resources and strategies were expected to be an important source of influence on the process of recovery, but this was not demonstrated in this thesis, mainly becuase of a lack of appropriate methods for monitoring coping strategies. Also, it is questionable whether it is appropriate to consider the outcome of coping in terms of the indices of recovery used in this thesis. For any individual the most appropriate method of coping may not relate solely to physical performance. Emotion focussed coping in the early stages may be most appropriate with later attention to coping directly with physical problems. Different coping strategies being more appropriate for different individuals. More detailed study of coping in recovery from physical disability is needed, examining individual aims of coping and the extent to which different strategies achieve these aims.

Because there was little previous work monitoring recovery from physical disability, methods of assessment and measurement were developed and tested, and these are available for use in further studies. The tests were specific for the two conditions used in the study, but provide guidelines for the development of short and reliable methods of measurement of physical performance. The separation of performance of movements and functions is important in examining physical disability.

The number of subjects included in each group in the final stage where recovery was monitored, was small, but in-depth investigation of a smaller number of subjects has provided a basis for later work. One of the strengths of this thesis is that even though the numbers were small, each stage was based on earlier work with similar groups of subjects; assumptions were not made about the populations, later work was based on observation and description, and therefore the methods developed were appropriate to these populations.

Though there were differences between the two groups of subjects the fact that there were also similarities, with some subjects with a wrist fracture having more extreme appraisals of their condition than others with the objectively more serious condition of stroke. This suggests that there may be implications for recovery from physical disability beyond the two specific diagnostic groups studied, but this needs to be tested further with subjects with a wider range of physical disabilities.

Assessing everyday performance and working in a clinical situation imposes constraints of time and use of methods and the necessity in some instances of relying on personal reports with all their inherent problems, but if it is real life performance that is of interest, despite some possible inaccuracy, it is appropriate to study the naturally occurring situation. Creating a separate situation where variables could be more tightly controlled, for example dressing in an A.D.L. Unit with specific standardised items might have resulted in a more controlled test situation of performance, but this could not be shown to be related to real life performance.

A number of hypotheses proposed in this thesis were supported, there was little relationship between any measures of individual appraisal and objective measures of severity. The perspective of the individual not focussing on objective severity but on 'what this means to me' is similar to the findings of Herzlich's (1973) study. The subjects of this study saw their limitation of performance in terms of restriction in the performance of functions and activities more in terms of handicap than disability. Therapists and other professional health care staff viewed the patient's condition in terms of impairment and disability. This would suggest that there is a need when planning programmes for patients with physical disability not only to take into account impairment and disability, but to link this explicitly to the handicaps experienced by the

individual. Goals of treatment to be motivating must relate to specific restricted functions of immediate concern to the individual.

This thesis has provided a contribution to knowledge about recovery from physical disability and some of the factors associated with that recovery. It has develped methods of measurement that are valid and reliable which can be used in further studies.

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APPENDIX

Table A1. Pilot Work Raw Scores (Stroke Subjects)

	QA		QL		GBM Dis.		GBM Ind.		P. care	
	1	2	1	2	1	2	1	2	1	2
1	4	5	4	5	7	7	6	7	1	4
2	0	0	2	4	6	7	2	4	4	6
3	0	0	1	5	6	6	1	3	2	2
4	5	5	4	6	5	6	3	4	0	0
5	0	0	0	4	7	7	1	2	0	1
6	0	1	1	3	6	6	0	0	1	1
7	6	8	3	5	6	7	1	6	0	3
8	0	4	1	3	6	6	2	4	1	3
9	0	0	3	4	7	7	0	1	2	5
10	0	0	0	0	6	6	3	4	n = 9	
11	0	0	0	0	6	7	2	3		
12	0	0	2	4	5	6	0	1		
	n =12		n= 12		n =12		n =12			

Table A2 Pilot Work Raw Scores (Wrist)

	GRIP				ULNAR DEVIATION			
	Affected		Unaffected		Affected		Unaffected	
Occasions	1	2	1	2	1	2	1	2
1	26	45	140	145	30	40	52	50
2	50	80	130	130	29	30	60	62
3	46	84	200	195	34	38	61	60
4	40	80	180	180	40	42	48	50
5	36	75	160	150	25	30	59	60
6	45	62	140	135	30	35	50	50
7	56	75	135	140	40	42	63	65
8	50	70	150	155	30	36	62	60
9	46	80	170	160	39	41	58	59
10	38	69	130	130	50	52	69	70

Scores in mm Hg.

	EXTENSION				RADIAL DEVIATION			
	Affected		Unaffected		Affected		Unaffected	
Occasions	1	2	1	2	1	2	1	2
1	20	20	40	41	40	48	80	80
2	25	25	27	25	38	42	79	80
3	40	45	65	62	50	55	76	75
4	30	42	60	60	38	38	60	62
5	20	25	39	35	50	60	74	72
6	18	25	42	40	41	53	82	84
7	35	40	60	58	52	59	84	80
8	20	25	38	35	40	51	80	82
9	15	20	27	25	38	40	69	71
10	10	15	25	25	61	68	77	76
	n = 10		n = 10		n = 10		n = 10	

Table A2 Pilot Work Raw Scores (Wrist Continued)

	PRONATION				SUPINATION			
	Affected		Unaffected		Affected		Unaffected	
Occasions	1	2	1	2	1	2	1	2
1	60	71	90	90	48	50	65	65
2	58	58	82	80	42	51	72	70
3	62	66	91	90	38	44	60	61
4	65	67	79	80	50	50	70	69
5	59	62	89	85	44	49	68	67
6	70	70	80	78	33	39	59	59
7	58	63	85	80	50	52	71	70
8	65	72	87	85	39	42	65	60
9	65	70	92	90	51	62	70	68
10	68	71	80	80	42	50	68	70

Scores in degrees

n = 10

Table A3 Stroke Group Raw Scores

	GBM Ind.			GBM Dis.			QA			QL		
Occasions	1	2	3	1	2	3	1	2	3	1	2	3
1	3	7	x	7	7	x	4	5	x	4	5	x
2	0	0	4	6	7	7	0	0	0	2	4	5
3	1	2	7	6	7	7	0	0	8	1	5	5
4	6	7	x	7	7	x	5	5	x	4	6	x
5	1	6	7	6	6	7	0	0	0	0	4	4
6	0	4	7	6	7	7	0	1	1	1	3	2
7	3	6	7	7	7	7	6	8	8	3	5	4
8	0	2	5	6	6	7	0	4	6	1	3	3
9	1	4	5	6	7	7	0	0	3	3	4	4
10	0	2	2	6	6	6	0	0	0	0	0	0
11	0	0	1	6	7	7	0	0	0	0	0	1
12	3	2	x	6	7	x	0	0	x	2	4	x
13	2	3	7	6	7	7	6	7	8	4	5	4
14	0	2	2	5	7	7	0	0	3	2	3	4
15	0	1	5	7	7	7	0	0	0	3	5	5
16	1	7	x	6	7	x	6	8	x	4	5	x
17	3	7	x	7	7	x	0	0	x	5	5	x
18	0	0	0	5	6	7	0	0	0	0	0	0
19	1	7	x	6	7	x	0	2	x	1	5	x
20	1	5	7	6	7	7	8	8	8	3	5	4

GBM Ind. Gross body movement Independence.

GBM Dis. Gross body movement Disability.

QA Quality arm movement.

QL Quality leg movement.

Table A3 Stroke Group Raw Scores (continued)

Occasions	M/C Score	P. care 1	P. care 2	P. care 3	Ratings 1	Ratings 2	Ratings 3	Mood States T	Mood States A	Mood States F	Mood States V	Mood States D
1	-	0	3	-	17	35	20	1	1	4	3	3
2	-	1	3	5	13	51	28	7	4	11	3	6
3	25	4	4	5	17	34	26	2	10	2	17	1
4	14	4	6	-	38	53	35	10	5	1	6	16
5	26	1	3	5	10	14	13	-2	2	0	12	0
6	16	1	2	5	10	43	40	6	2	3	2	10
7	-	2	2	5	27	43	28	6	1	4	0	4
8	-	0	0	0	19	56	48	11	10	4	0	6
9	22	0	0	2	28	38	23	11	5	15	4	7
10	-	0	1	1	10	42	38	2	0	10	1	5
11	-	0	2	2	12	39	39	8	10	10	6	9
12	-	1	1	-	18	59	57	3	0	10	2	15
13	18	1	4	5	15	43	33	5	2	6	7	2
14	-	0	3	4	33	57	42	1	2	4	2	2
15	27	0	3	5	23	47	41	3	1	5	1	5
16	-	4	5	-	21	59	35	14	0	8	2	10
17	-	1	3	-	27	52	40	1	2	1	0	3
18	14	0	1	1	18	40	36	9	6	7	8	8
19	20	2	5	-	15	27	26	9	2	4	14	4
20	22	0	3	5	11	53	47	8	6	4	0	16

M/C Marlowe Crowne
T Tension
A Anger
F Fatigue
V Vigor
D Depression

Table A4 Arc Sin Scores Stroke

	GBM Ind.			GBM Dis.			QA			QL		
Occasions	1	2	3	1	2	3	1	2	3	1	2	3
1	39	90	x	90	90	x	45	52	x	55	66	x
2	00	00	48	66	90	90	00	00	00	35	55	65
3	21	31	90	66	90	90	00	00	90	23	66	65
4	66	90	x	90	90	x	51	52	x	55	90	x
5	21	66	90	66	66	90	00	00	00	00	53	54
6	00	48	90	66	90	90	00	19	19	23	45	34
7	39	66	90	90	90	90	60	90	90	45	66	54
8	00	31	57	66	66	90	00	45	59	23	45	44
9	21	48	57	66	90	90	00	00	77	45	55	54
10	00	31	31	66	66	66	00	00	00	00	00	23
11	00	00	21	66	90	90	00	00	90	00	00	54
12	39	31	x	66	90	x	00	00	36	35	55	x
13	31	39	90	66	90	90	60	70	00	55	66	66
14	00	31	31	57	90	90	00	00	00	35	45	65
15	00	21	57	90	90	90	00	00	00	45	66	00
16	21	90	x	66	90	x	60	90	x	55	66	x
17	39	90	x	90	90	x	00	00	x	66	66	x
18	00	00	00	57	66	90	00	00	30	00	00	54
19	21	90	x	66	90	x	00	30	x	23	66	x
20	21	57	90	66	90	90	90	90	36	45	66	54

Table A5 Raw Scores Stroke Group P.O.M.S.

Subjects	Tension	Anger	Fatigue	Vigor	Depression
1	1	1	4	3	3
2	7	4	11	3	6
3	2	10	2	17	1
4	10	5	1	6	16
5	-2	2	0	12	0
6	6	2	3	2	10
7	6	1	4	0	4
8	11	10	4	0	6
9	11	5	15	4	7
10	2	0	10	1	5
11	8	10	10	6	9
12	3	0	10	2	15
13	5	2	6	7	2
14	1	2	4	2	2
15	3	1	5	1	5
16	14	0	8	2	10
17	1	2	1	0	3
18	9	6	7	8	8
19	9	2	4	14	4
20	8	6	4	0	16

Table A6 First Ratings Raw Scores Stroke Group

	Constructs										
Subjects	A	B	C	D	E	F	G	H	I	J	K
1	4	2	1	2	3	1	1	1	1	3	1
2	1	2	1	2	1	1	1	1	1	2	1
3	1	1	1	4	4	1	1	1	1	1	2
4	1	5	1	5	2	6	6	1	4	5	6
5	1	1	1	1	1	1	1	1	1	1	1
6	1	1	1	1	1	1	1	1	1	1	1
7	3	4	4	5	1	2	-	2	-	3	3
8	2	1	2	2	2	3	1	1	1	3	2
9	1	2	1	6	6	1	6	1	1	2	2
10	1	1	1	1	1	1	1	1	1	1	1
11	1	1	1	1	1	1	1	1	1	3	1
12	2	1	1	2	1	1	6	1	1	2	1
13	1	2	1	3	2	1	1	1	1	2	1
14	1	4	5	4	5	1	3	1	3	5	4
15	3	2	3	2	2	3	2	1	2	3	2
16	2	2	2	2	2	2	2	2	2	3	2
17	2	2	2	2	4	1	5	5	1	3	1
18	1	1	1	4	4	1	2	1	1	1	2
19	1	1	1	1	4	1	1	1	1	2	1
20	1	1	1	1	1	1	1	1	1	2	1

A = Active
B = Healthy
C = Able to enjoy life
D = Worried
E = Frustrated
F = Bored
G = Able to control life
H = Independent
I = Do job/see friends
J = Strong
K = Depression

Table A7 Second Ratings Raw Scores Stroke Group

	Constructs										
Subjects	A	B	C	D	E	F	G	H	I	J	K
1	6	4	1	2	2	5	6	1	6	6	2
2	4	3	4	6	6	6	6	6	6	5	5
3	4	1	3	4	6	4	2	4	1	3	3
4	6	6	6	6	6	6	5	1	5	5	6
5	1	1	1	1	3	1	1	3	1	1	1
6	5	1	6	6	4	1	5	6	-	6	3
7	5	5	4	4	4	3	5	5	-	5	3
8	6	6	6	6	6	6	6	6	4	4	4
9	6	2	6	4	6	2	4	2	5	4	2
10	6	5	5	1	1	6	6	6	5	5	1
11	6	1	1	4	6	6	5	5	-	2	3
12	6	6	6	5	6	6	6	6	-	6	6
13	4	4	4	5	4	5	4	5	-	4	4
14	6	6	6	6	4	6	6	6	-	6	5
15	6	4	4	5	5	5	5	5	6	5	3
16	6	5	6	6	6	6	6	6	6	6	6
17	5	2	6	5	6	6	6	6	5	5	5
18	4	2	6	4	6	1	6	3	-	2	6
19	3	3	2	4	2	2	3	2	1	2	4
20	6	6	6	5	6	6	6	6	4	6	4

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I = Do job/see friends
J = Strong
K = Depression

Table A8 Attainment Scores (Stroke)

Stroke

	GBM Ind.	GBM Dis.
1	1.29	0.99
2	0.00	1.04
3	0.71	1.09
4	0.95	0.99
5	1.69	0.89
6	1.95	1.09
7	0.95	1.03
8	1.26	0.80
9	1.00	1.00
10	1.55	0.89
11	0.00	1.22
12	0.49	1.04
13	0.61	0.97
14	1.14	1.03
15	0.72	1.02
16	1.64	0.97
17	1.34	0.94
18	0.00	0.88
19	2.06	1.09
20	1.03	1.02

Table A9 Wrist Group Raw Scores

	Flex/Pro		UD/RD		Sup/Ext		Grip	
Occasions	1	2	1	2	1	2	1	2
1	58	65	80	88	68	70	47	38
2	39	66	40	40	13	31	37	46
3	49	64	70	90	50	72	32	60
4	54	70	64	71	33	47	25	44
5	53	70	39	57	50	82	37	54
6	74	78	25	42	55	88	39	60
7	58	75	40	64	50	72	45	50
8	79	84	45	91	53	65	33	45
9	52	60	39	61	70	79	37	54
10	67	69	63	82	54	63	70	72
11	63	66	50	71	36	52	35	42
12	98	98	90	94	77	86	36	71
13	68	79	68	89	51	66	50	55
14	71	72	84	85	48	58	14	25
15	73	75	69	74	73	78	45	50
16	56	68	59	74	59	74	35	63
17	56	85	63	72	28	70	42	64
18	80	89	79	82	87	90	66	70
19	63	75	53	80	51	60	32	51
20	55	62	65	81	66	71	50	58

Table A9 Wrist Group Raw Scores (continued)

	Ratings			P. care		M/C	Mood State T	A	F	V	D
Occasions	1	2	3	1	2						
1	10	60	43	0	3	-	17	7	16	2	17
2	30	41	28	0	5	27	6	3	6	7	5
3	17	22	40	0	5	21	7	6	2	9	3
4	12	29	30	0	0	-	3	10	1	6	8
5	17	37	16	0	3	15	2	2	12	4	1
6	10	15	11	0	5	14	1	0	0	3	1
7	11	18	10	0	5	22	0	1	2	7	0
8	20	36	19	3	5	-	5	2	0	0	1
9	18	32	26	0	5	-	6	3	3	3	3
10	11	26	12	0	5	-	5	3	2	7	7
11	13	36	34	3	5	-	15	4	12	1	22
12	10	13	10	0	5	10	0	4	3	9	0
13	12	25	15	0	5	20	12	3	10	5	11
14	11	17	14	0	5	22	0	0	0	13	0
15	-	-	-	0	5	-	8	11	11	6	9
16	18	28	24	0	5	-	2	2	4	2	1
17	22	51	36	0	5	-	5	3	4	0	8
18	10	17	14	0	5	22	2	0	2	6	0
19	11	11	19	0	5	25	0	0	4	13	1
20	11	23	15	0	0	22	4	3	2	3	1

M/C Marlowe Crown
T Tension
A Anger
F Fatigue
V Vigor
D Depression

Table A10 Raw Scores Wrist Group P.O.M.S.

Subjects	Tension	Anger	Fatigue	Vigor	Depression
1	17	7	16	2	17
2	6	3	6	7	5
3	7	6	2	9	3
4	3	10	1	6	8
5	2	2	12	4	1
6	1	0	0	3	1
7	0	1	2	7	0
8	5	2	0	0	1
9	6	3	3	3	3
10	5	3	2	7	2
11	0	4	3	9	0
12	0	4	3	9	0
13	12	3	10	5	11
14	0	0	0	13	0
15	8	11	11	6	9
16	2	2	4	2	1
17	5	3	4	0	8
18	2	0	2	6	0
19	0	0	4	13	1
20	4	3	2	3	1

Table A 11 First Ratings Raw Scores Wrist Group

	Constructs										
Subjects	A	B	C	D	E	F	G	H	I	J	K
1	1	1	1	1	1	1	1	1	1	1	1
2	1	2	5	6	1	5	5	1	1	2	2
3	1	1	1	4	4	2	1	1	-	1	2
4	1	1	1	1	1	1	1	3	1	1	1
5	2	1	2	1	1	1	1	1	1	3	3
6	1	1	1	1	1	1	1	1	1	1	1
7	1	1	1	2	1	1	1	1	1	1	1
8	1	1	1	6	1	4	1	1	1	2	2
9	1	1	1	3	1	6	1	1	1	1	2
10	1	2	1	1	1	1	1	1	1	1	1
11	1	1	1	2	2	1	1	1	1	2	1
12	1	1	1	1	1	1	1	1	1	1	1
13	1	1	2	1	1	1	1	1	1	1	2
14	1	1	1	2	1	1	1	1	1	1	1
15	-	-	-	-	-	-	-	-	-	-	-
16	1	-	2	6	1	1	1	1	1	3	2
17	1	4	2	4	2	3	1	1	2	3	1
18	1	1	1	1	1	1	1	1	1	1	1
19	1	1	1	1	1	2	1	1	1	1	1
20	1	1	-	3	1	1	-	1	1	1	2

A = Active
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C = Able to enjoy life
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G = Able to control life
H = Independent
I = Do job/see friends
J = Strong
K = Depression

Table A12 Second Ratings Raw Scores Wrist Group

	Constructs										
Subjects	A	B	C	D	E	F	G	H	I	J	K
1	6	6	6	6	6	6	6	6	6	6	6
2	4	4	6	6	3	6	6	1	4	4	1
3	4	1	1	4	4	2	1	1	-	1	3
4	4	1	3	6	1	1	2	4	6	1	6
5	6	1	4	6	6	1	2	4	5	4	3
6	6	1	1	1	1	1	1	1	6	1	1
7	3	2	3	4	1	1	1	1	2	1	1
8	5	3	2	6	5	2	1	6	5	3	3
9	5	3	5	4	5	5	1	1	5	1	2
10	3	1	4	5	4	1	4	2	2	1	1
11	3	3	5	6	5	1	3	1	3	6	3
12	3	1	1	2	1	1	1	1	3	1	1
13	2	2	3	3	2	1	1	3	2	1	4
14	1	1	1	3	5	1	1	1	4	1	2
15	-	-	-	-	-	-	-	-	-	-	-
16	5	-	2	6	1	1	1	1	4	4	3
17	5	4	6	5	6	6	5	5	6	5	2
18	2	1	1	1	1	5	1	1	3	3	1
19	1	1	1	1	1	2	1	1	1	1	1
20	4	4	-	5	1	1	-	2	5	3	3

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H = Independent
I = Do job/see friends
J = Strong
K = Depression

Table A13 Arc Sin Scores Wrist

	Flex/Pro		UD/RD		Sup/Ext		Grip	
Occasion	1	2	1	2	1	2	1	2
1	50	68	64	53	56	56	43	37
2	39	39	39	55	21	33	37	42
3	44	70	57	53	45	57	34	50
4	47	57	52	53	35	42	30	41
5	46	48	39	57	45	64	37	46
6	59	39	30	67	48	68	39	50
7	50	53	39	60	45	57	42	45
8	62	71	43	66	46	53	35	42
9	46	51	39	51	57	61	37	46
10	55	64	53	56	47	52	57	58
11	53	57	45	55	36	46	36	39
12	44	73	71	44	61	66	36	57
13	56	70	56	62	46	54	45	47
14	58	66	66	58	44	49	22	30
15	59	59	56	60	59	61	42	44
16	48	59	50	56	50	59	36	52
17	48	57	53	68	32	56	40	53
18	64	64	62	71	70	70	55	56
19	53	62	46	60	46	50	34	45
20	48	64	54	52	55	57	45	49

Table A14 Attainment Scores (Wrist)

Wrist

	Flex/Pro	UD/RD	Sup/Ext	Grip
1	0.99	1.06	0,95	0,75
2	1.01	1.13	0.85	0.92
3	1.04	1.28	1.08	1.11
4	1.03	1.22	0.91	1.01
5	1.06	0.02	1.14	0.98
6	0.97	0.79	1.14	1.13
7	1.04	1.05	1.01	0.93
8	1.02	1.39	0.96	1.04
9	1.01	0.88	0.94	0.95
10	0.89	1.14	0.96	1.06
11	0.90	1.26	0.96	0.93
12	1.14	1.06	1.07	1.18
13	1.01	1.27	1.02	0.99
14	0.98	1.20	0.99	0.89
15	1.01	0.93	0.98	0.94
16	1.05	0.90	1.02	1.13
17	1.16	1.27	1.28	1.17
18	1.13	0.87	1.02	1.04
19	1.03	1.19	0.91	1.06
20	0.97	1.25	0.94	0.95

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Table A16. Point biserial correlation between themes of dependency and attainment scores

Stroke Group

Attainment Scores	t	Significance
GBM Dis	0.8014	NS
GBM Ind	0.6921	NS
QA	0.3302	NS
QL	1.010	NS

n = 9

Wrist Group

Attainment Scores	t	Significance
Flex/pro	1.1000	NS
UD/RD	0.6671	NS
Sup/Ext	0.5723	NS
Grip	1.0500	NS

n = 7

No results reached significance

Table A17 Foward entry regression analysis (Stroke)

Dependent Variable	Independent variables in the equation	Independent variables not in the equation	Significance of T
GBM Ind.	Fatigue		.013
	Q. Leg.		.000
	Ratings 2		.004
		Tension	.158
		Time	.323
		Quality Arm	.503
		Vigor	.691
		Depression	.756
		GBM Ind.	.825
		Anger	.900
		L.O.C.	.977
GBM Dis.	GBM Dis 1.		.000
	L.O.C.		.001
		Time	.050
		Anger	.054
		Tension	.066
		Fatigue	.118
		QL	.198
		Ratings	.243
		Depression	.323
		Vigor	.378
		QA	.734

Table A18 Forward entry regression analysis (Wrist)

Dependent Variable	Independent variables in the equation	Independent variables not in the equation	Significance of T
Sup/Ext.	Sup/Ext.		.000
		UD/RD	.106
		Vigor	.190
		Anger	.225
		L.O.C.	.240
		Tension	.271
		Depression	.360
		P. care	.585
		Time	.567
		Fatigue	.850
		Grip	.854
		Rating 2	.969
		Flex/pro.	.977
UD/RD	UD/RD1		.000
	P. care 1		.021
		Sup/Ext.	.150
		Depression	.187
		L.O.C.	.231
		Rating 2	.267
		Flex/pro.	.386
		Fatigue	.475
		Grip	.505
		Vigor	.690
		Anger	.726
		Tension	.782
		Time	.795
Grip	Grip 1		.000
	Tension		.019
		Flex/Pro.	.112
		Anger	.245
		Time	.271

Table A18 Forward entry regression analysis (Wrist) (continued)

Dependent Variable	Independent variables in the equation	Independent variables not in the equation	Significance of T
Grip		L.O.C.	.416
		Vigor	.436
		UD/RD	.610
		Fatigue	.731
		Sup/Ext.	.804
		Rating	.822
		P. care	.829
		Depression	.953
Flex/Pro.	Flex/Pro. 1		.001
	Sup/Ext. 1		.012
		L.O.C.	.162
		P. care	.190
		Grip	.223
		Vigor	.377
		Depression	.393
		Tension	.420
		Anger	.455
		Rating 2	.429
		UD/RD	.563
		Time	.724
		Fatigue	.811
P. care	P. care 1		.000
	Grip 1		.466
		Time	.365
		Tension	.513
		Sup/Ext.	.520
		Flex/Pro.	.549
		UD/RD	.614
		Rating 2	.620
		Vigor	.729
		L.O.C.	.741
		Anger	.788
		Fatigue	.825

Table A19 Backward elimination regression analysis (Stroke)

Dependent Variable	Independent variables in the equation	Independent variables not in the equation	Significance of T
GBM Ind.	None		N.S.
GBM Dis.	None		N.S.
Quality of arm movement	Anger		.048
		Tension	.054
		P. care 1	.102
		GBM Ind. 1	.110
		QA 1	.115
		QL 1	.338
		GBM Dis. 1	.364
		Depression	.379
		Fatigue	.414
		Rating	.712
		Time	.634
		L.O.C.	.869
		Vigor	.944
Quality of leg movement	GBM Ind. 1		.000
	GBM Dis. 1		.021
	L.O.C.		.050
	Anger		.096
		Time	.289
		Depression	.439
		Tension	.487
		QL	.540
		Rating	.600
		P. care	.609
		QA	.645
		Vigor	.841
		Fatigue	.862

Table A19 Backward elimination regression analysis (Stroke)(continued)

Dependent Variable	Independent variables in the equation	Independent variables not in the equation	Significance of T
Personal care	P. care 1		.001
	Rating		.001
	GBM Ind. 1		.013
	QL 1		.001
		Tension	.101
		Anger	.154
		Fatigue	.222
		QA 1	.472
		Vigor	.524
		L.O.C.	.572
		Time	.641
		GBM Dis.	.703
		Depression	.776

Table A20 Backward elimination regression analysis (Wrist)

Dependent Variable	Independent variable in the equation	Independent variable not in the equation	Significance of T
Flex/Pro	Depression		.033
	Grip		.003
	Tension		.036
	L.O.C.		.000
		Flex/Pro	.001
		Time	.110
		Ratings	.219
		Vigor	.552
		Sup/Ext.	.654
		UD/RD	.670
		Fatigue	.700
		P. care	.707
		Anger	.926
Sup/Ext	Time		.005
	Vigor		.016
	Fatigue		.089
	Grip		.064
	Tension		.012
	Rating		.041
	UD/RD		.026
	L.O.C.		.003
		Sup/Ext	.089
		Flex/Pro	.239
		P. care	.600
		Anger	.865
		Depression	.912
UD/RD	P. care		.021
	UD/RD		.000
	L.O.C.		.010

Table A20 Backward elimination regression analysis (Wrist)(continued)

Dependent Variable	Independent variable in the equation	Independent variable not in the equation	Significance of T
UD/RD		Sup/Ext	.102
		Flex/Pro	.238
		Grip	.316
		Time	.415
		Depression	.416
		Rating	.522
		Vigor	.528
		Fatigue	.719
		Anger	.773
		Tension	.939
Grip	Anger		.027
	Grip 2		.000
	Tension		.004
	L.O.C.		.005
		Depression	.589
		Fatigue	.709
		Rating	.842
		Flex/Pro	.953
		Vigor	.958
P. care	Time		.015
	P. care		.003
	Vigor		.055
	Grip		.002
	L.O.C.		.026
		Flex/Pro	.362
		Anger	.494
		Rating 2	.601
		UD/RD	.601
		Sup/Ext	.602
		Tension	.810
		Depression	.966

Table A20 Backward elimination regression analysis (Wrist) (continued)

Dependent Variable	Independent variable in the equation	Independent variable not in the equation	Significance of T
Restriction of activity	Rating		.019
	UD/RD		.003
		Flex/Pro	.147
		Anger	.266
		Sup/Ext	.269
		P. care 1	.393
		Fatigue	.503
		Depression	.613
		L.O.C.	.756
		Vigor	.760
		Tension	.811
		Time	.843
		Grip	.879

Table A21 Stepwise regression analysis (Stroke)

Dependent Variable	Independent variables in the equation	Independent variables not in the equation	Significance of T
Quality of arm movement	Tension		.01
		Anger	.14
		Fatigue	.90
		Vigor	.36
		Depression	.79
		Ratings	.53
		GBM Dis. 1	.40
		GBM Ind. 1	.22
		QA 1	.55
		QL 1	.96
		P. care 1	.28
		L.O.C.	.97
		Time	.61
Quality of leg movement	GBM Dis. 1		.00
	GBM Ind. 1		.00
		Tension	.45
		Anger	.13
		Fatigue	.56
		Vigor	.51
		Depression	.42
		Ratings	.62
		QA 1	.95
		QL 1	.49
		P. care	.42
		L.O.C.	.06
		Time	.55
GBM Dis. 2	none		N.S.
GBM Ind. 2	none		N.S.
P. care	P. care 1		.02
		Tension	.18
		Anger	.18

Table A21 Stepwise regression analysis (Stroke) (continued)

Dependent Variable	Independent variables in the equation	Independent variables not in the equation	Signigicance of T
P. care		Fatigue	.15
		Vigor	.84
		Depression	.30
		Rating	.13
		GBM Dis. 1	.48
		GBM Ind. 1	.86
		QA 1	.19
		QL 1	.23
		L.O.C.	.40
		Time	.64

Table A22 Stepwise regression analysis (Wrist)

Dependent Variables	Independent variable in the equation	Independent variable not in the equation	Significance of T
Sup/Ext	Sup/Ext 1		.000
		Tension	.27
		Anger	.22
		Fatigue	.85
		Vigor	.19
		Depression	.36
		Ratings	.96
		Flex/Pro 1	.97
		UD/RD 1	.10
		Grip 1	.85
		P. care 1	.58
		L.O.C.	.24
		Time	.56
UD/RD	UD/RD 1		.000
	P. care 1		.02
		Tension	.78
		Anger	.72
		Fatigue	.47
		Vigor	.69
		Depression	.18
		Ratings	.26
		Flex/Pro 1	.38
		Grip 1	.15
		P. care 1	.50
		L.O.C.	.23
		Time	.79
Flex/Pro	Flex/Pro 1		.00
	Sup/Ext 1		.04
		Tension	.42
		Anger	.45
		Fatigue	.81

Table A22 Stepwise regression analysis (Wrist) (continued)

Dependent Variables	Independent variable in the equation	Independent variable not in the equation	Significance of T
Flex/Pro		Vigor	.37
		Depression	.39
		Ratings	.42
		UD/RD	.56
		P. care	.19
		Grip	.22
		L.O.C.	.16
		Time	.72
Grip	Grip 1		.00
	Tension		.01
		Anger	.24
		Fatigue	.73
		Vigor	.43
		Depression	.95
		Ratings	.82
		Flex/Pro	.11
		UD/RD	.61
		Sup/Ext	.80
		P. care	.82
		L.O.C.	.41
		Time	.27
P. care	P. care 1		.00
	Grip 1		.04
		Tension	.51
		Anger	.78
		Fatigue	.82
		Vigor	.72
		Depression	.98
		Ratings	.62

Table A22 Stepwise regression analysis (Wrist) (continued)

Dependent Variables	Independent variable in the equation	Independent variable not in the equation	Significance of T
P. care		Flex/Pro	.54
		UD/RD	.61
		Sup/Ext	.52
		L.O.C.	.74
		Time	.36